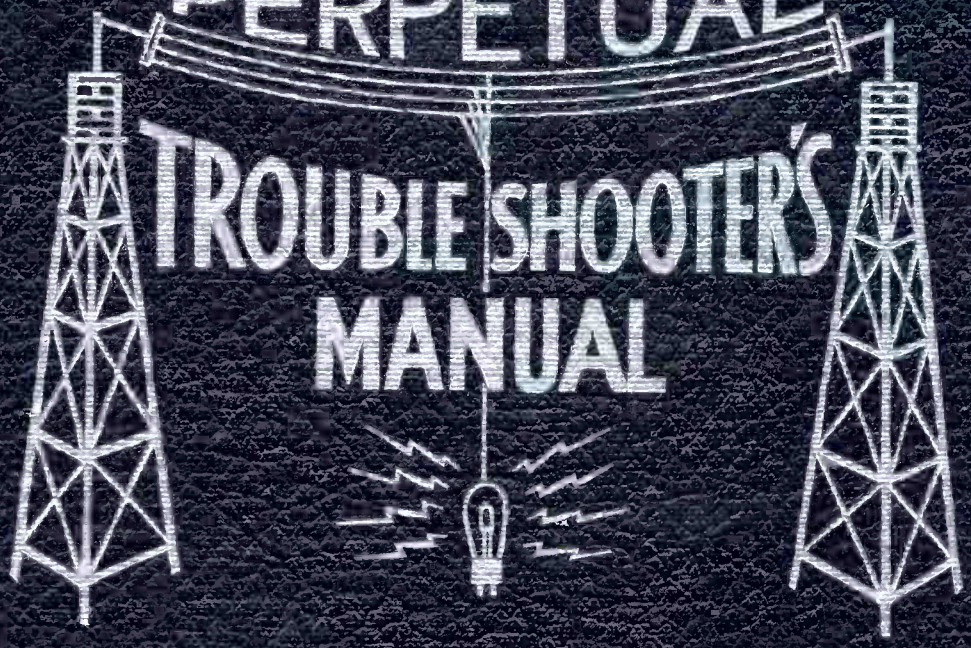
VOLUME IV

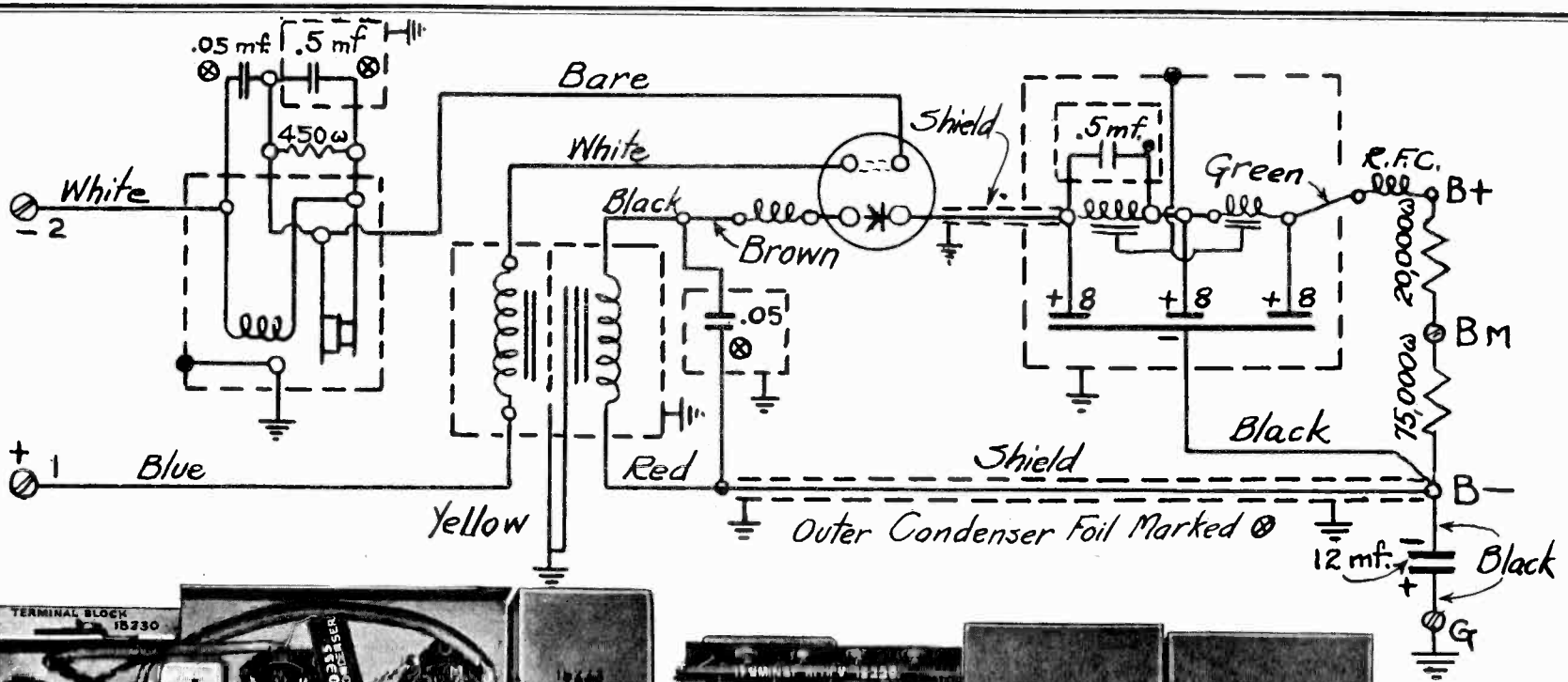
PERPETUAL TROUBLE SHOOTER'S MANUAL

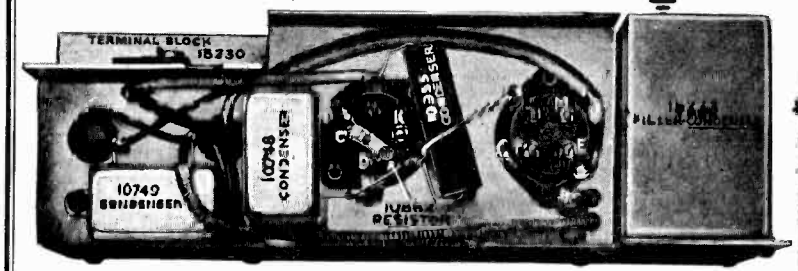


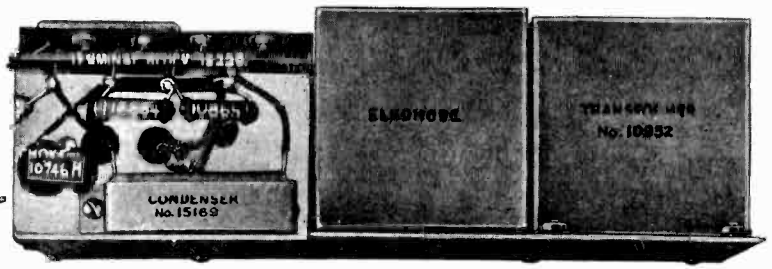
JOHN F. RIDER

P. R. MALLORY & CO.

MODEL Elkon
Standard Type
Auto "B" Elim.
Schematic







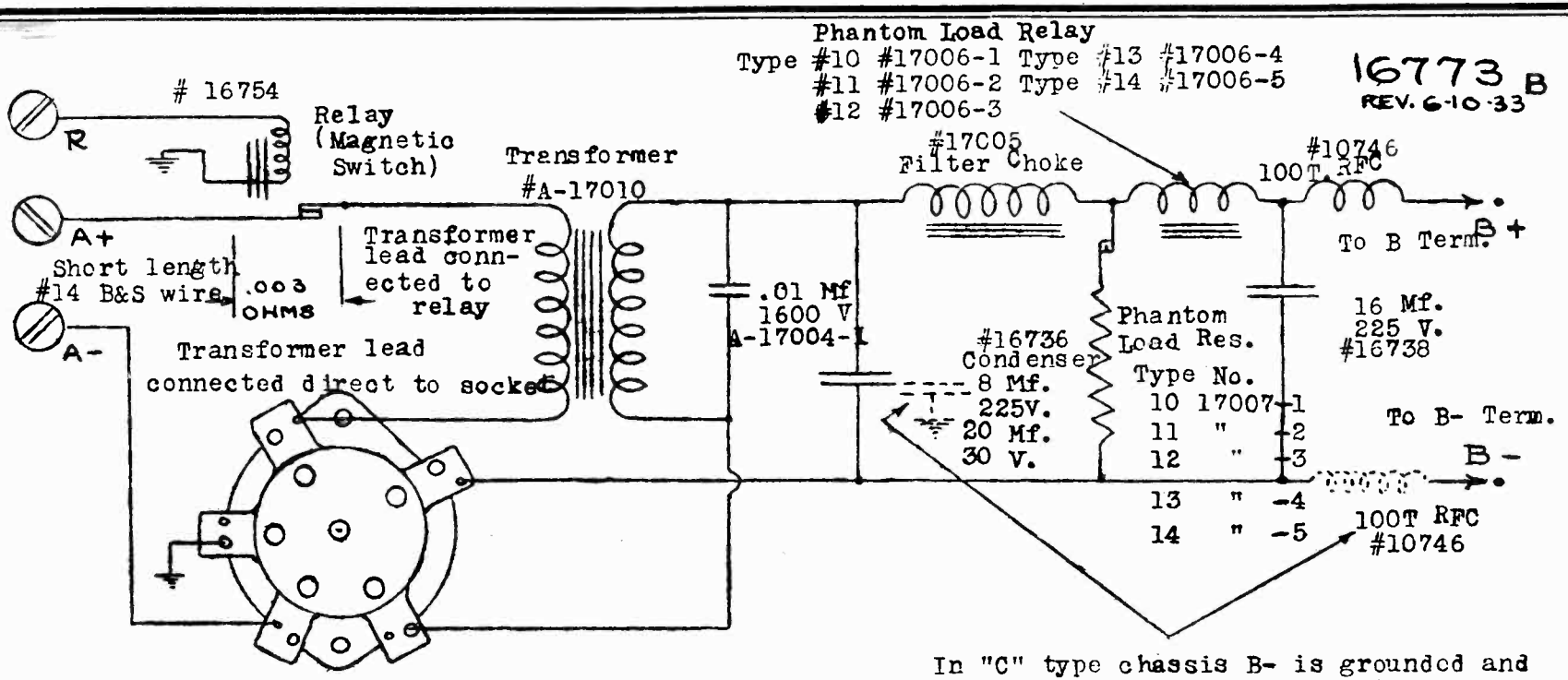
Mallory B-Eliminators: The following are the specifications for the new Mallory Auto-Radio B eliminators.

When checking these elminators for servicing, never connect the eliminator to a storage battery until there is a load resistor connected across the 3 minus to B plus terminals of the eliminator. If the storage battery is ungrounded, that is, is not in the car, then connect the A plus terminal to eliminator terminal 1, and the A minus terminal to the eliminator terminal 2, using not smaller than No. 14 B and S wire. When testing the eliminator the load resistor should be rated at 6000 ohms and 25 watts. While it is true that a 10-watt resistor is within the actual current rating, the 25-watt resistor is preferred. Resistances rated at less than 10 watts, will overheat very badly. The 6000 ohm load resistance is the equivalent of the average radio receiver.

Type	Amperes Input	Current At 180 V	Current at 135 V.
6	2.45	35 ma.	46 ma.
5	2.1	30 ma.	40 ma.
4	1.8	25 ma.	33 ma.
3	1.5	20 ma.	27 ma.
2	1.2	15 ma.	20 ma.
1	1.1	12 ma.	16 ma.

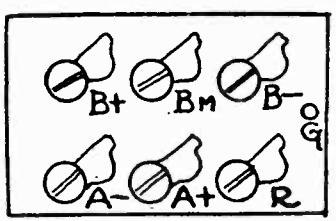
MODEL Elkon Type C
Eliminator
Schematic

P. R. MALLORY & CO.



In "C" type chassis B- is grounded and condenser and choke are omitted.

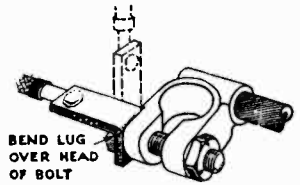
It is imperative that the total resistance of the cable connecting the eliminator "A" and "A"- terminals to the battery terminals be .042 ohms or less



THE APPROVED MALLORY-ELKON "B" ELIMINATOR FOR LEADING AUTO RADIO RECEIVERS

Make	Model No.	Type	Make	Model No.	Type
Ajax		11 C	Motorola	7 T 38	10
Auto Lite	82	12	Motorola	7 T 47 A	10
Autotone	(Republic)	10	Ohio	6 Tube	11 C
Bosch	80	14	Philco	3	12*
Bosch	84	14	Philco	6	11 C
Bosch	9:20	11 PC	Philco	7 (using '38 Output Tube)	12 P
Cadillac	7 Tube	11 C			
Colonial	53	11	Philco	7 (using '41 Output Tube)	11 P
Colonial	54	13			
Crescent	1931	11	Philco	8	10 C
Crosley	95 (using '38 Output Tube)	12 C	R.C.A. Victor	M 32	11 C
			Sparton	AR 19	12 PC
Crosley	95 (using '41 Output Tube)	11 C	Sparton	34	10 ST
			Sparton	40	13 S
Crosley	96	11 C	Roamio	91	13*
Erla	261	12 PC	Roamio	92	11
Gulbransen	6 Tube	11 C	Truetone	6 Tube	11 C
Gulbransen	7 Tube	11 C	Universal	57	11
Majestic	110	11	Universal	70	11
Majestic	114	11 C	Universal	77	11
Motometer		12 C	Wells Gardner	6 Tube	11 C
Motorola	5 Tube	11 M	Wells Gardner	7 Tube	11 C
Motorola	6 Tube	10			
Motorola	5 T 71	11 M	* Mallory "A" Choke Required.		

THE CABLE for the new Mallory-Elkon "B" Eliminator consists of two wires within a braided metal covering. The **red** wire of this cable is positive "A," and the **green** wire is negative "A." Positive and negative "A" battery lugs are provided on the battery end of this cable (see illustration at right for method of connecting to battery). The braided metal strap at battery end should be screwed into the harness lug which is connected to the *grounded* post of storage battery. The other end of the cable should be attached to the "A" terminal screws on the terminal board of the eliminator, and proper polarity of these terminals must be observed, **red** to A+ and **green** to A—. Connect braided metal strap to one of Eliminator lid screws.



CAUTION: Never use anything except the Standard Mallory-Elkon Cable Assembly and never connect it to any point except directly to both the storage battery terminals.

REASON: Any deviation from this use of cable will affect time constant of vibrator and seriously shorten life of vibrator points.

THE TERMINAL MARKED "R" on the terminal board is for the operation of the relay which is contained in the eliminator housing, and this connection is made as follows:

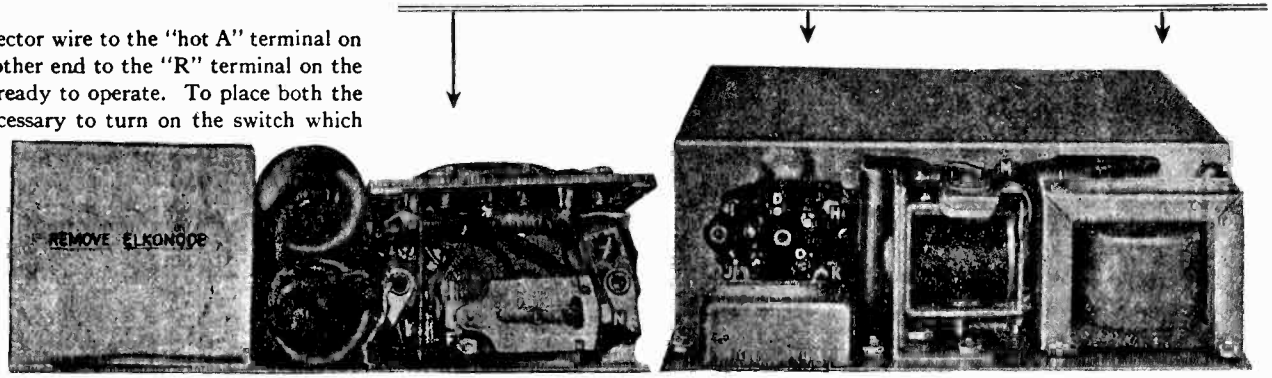
1. Ascertain the "hot A" terminal on the terminal board of your loud speaker by turning set switch on and connecting an ordinary automobile dash lamp in series between the frame of the car or any grounded point and the "hot A" terminal of the speaker. There are four or more terminals on the terminal board of your speaker and the one which permits this test lamp to light will be the "hot A" terminal. (Permanent magnet type speakers having no terminals, require that relay wire be connected to load side of set switch, either in control-head or in set.) Turn set switch off while test-lamp is still connected, making sure lamp turns off with switch.

2. Attach one end of the special relay connector wire to the "hot A" terminal on the loud speaker terminal board and connect the other end to the "R" terminal on the eliminator terminal board. Your receiver is now ready to operate. To place both the receiver and the eliminator in operation, it is necessary to turn on the switch which operates the receiver. An automatic switch device is incorporated in the eliminator which turns the eliminator on when the receiver is turned on and turns it off when the receiver is turned off. From 30 to 60 seconds may be required before a signal is heard from the loud speaker, this being the time required by various types of tubes to reach proper operating heat.

5. CONTINUITY AND SERVICE TEST. This test is to be made with the Elkonode removed from the eliminator.

It is assumed that before these tests are made the eliminator will be examined for poorly soldered or broken connections.

Continuity Between	Correct Continuity	Incorrect Continuity	Defect	Correction
R to GND	220 Ohms	Open	Open relay coil	Replace relay
"A+" to E	Closed	Open	Broken connection	Resolder
F to H	Closed	Open	Open transformer primary	Replace transformer
I to "A—"	Closed	Open	Broken connection	Resolder
H to GND	Open	Closed	Grounded transformer primary	Replace transformer
D to GND	Closed	Open	Broken connection	Resolder
J to K	90 Ohms	Open	Open transformer secondary	Replace transformer
J to K	90 Ohms	Closed	Shorted buffer condenser	Replace buffer condenser
J to GND	Open	Closed	Grounded transformer secondary or defective filter condenser	Replace transformer Replace 8 mfd. filter condenser
K to L	230 Ohms	Open	Open filter choke	Replace filter choke
K to GND	Open or 5000 to 12,000 Ohms	Closed	Grounded filter choke or shorted filter condenser	Replace filter choke or 8 mfd. filter condenser
L to M	40 to 80 Ohms	Open	Open relay coil	Replace relay
L to O	5,000 Ohms to 12,000 Ohms	Open	Open phantom load resistor	Replace load resistor
M to N	Closed	Open	Broken connection	Resolder
O to "B—"	Closed	Open	Broken connection or defective R. F. C.	Resolder or replace R. F. C.
N to "B+"	Closed	Open	Defective R. F. C.	Replace R. F. C.
"B—" to "B+"	5,000 to 12,000 Ohms	Short 270 to 310 Ohms	Shorted 16 MF Shorted 8 MF	Replace Replace



MODEL Elkon Auto "B" Eliminator
Power Connections

P. R. MALLORY & CO.

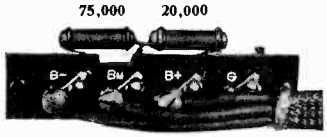
Auto-Lite Model 82 — **Eliminator Type 5**

Remove Resistors

Green Red Shield

Connect "A" Hot of Radio Set to Relay

Atwater Kent Model 81 — **Eliminator Type 4**



Black Red White

Connect "A" Hot of Radio Set to Relay
Use Regular "C" Batteries

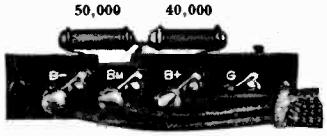
Atwater Kent Model 91 — **Eliminator Type 6**

Remove Resistors

Black White Shield

Connect "A" Hot (from Speaker) to Relay
Use Regular "C" Batteries

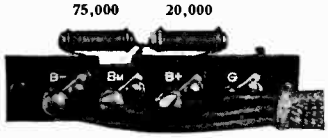
Bosch Model 9:20 — **Eliminator Type 5P**



Black White Red

Connect Black Wire from Radio Set to Relay

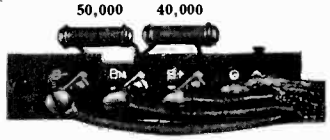
Majestic Model 110 — **Eliminator Type 6**



Black Yellow Red

Connect White Wire to Relay—Black to Grounded Battery Post

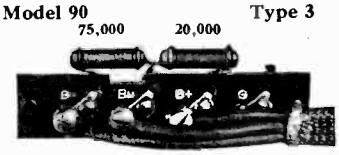
Philco Model 7 / Model 7 / Chassis Code 121 — **Eliminator Type** 3P for 135V / 5P for 180V



Black Green Blue Shield
White White White

Connect No. 14 Wire from "B—" to Relay, Preferably Shielded

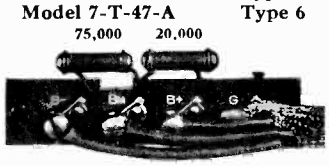
Crosley Model 90 — **Eliminator Type 3**



Black White Red

Connect "A" Hot of Radio Set to "A" Choke. "A" Choke to Relay
Use Regular "C" and "D" Batteries

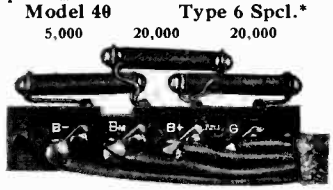
Motorola Model 7-T-38 — **Eliminator Type 6**
Model 7-T-47-A — **Type 6**



White Green Red Shield

Connect Yellow Wire to Relay. Black Wire to Grounded Battery Post

Sparton Model 40 — **Eliminator Type 6 Spcl.***



Yellow Ground Brown Red

Connect Black and Red Wire to Relay

Crosley Model 91 — **Eliminator Type 4**
Model 92 — **Type 6**

Remove Resistors

Green Red

Connect "A" Hot of Radio Set to "A" Choke. "A" Choke to Relay

Motorola Model 6 Tube — **Eliminator Type 6**

Remove Resistors

White Red

Connect Red Wire to Relay. Black Wire to Grounded Battery Post

Universal Models 60 and 70 — **Eliminator Type 6**

Remove Resistors

Red Shield

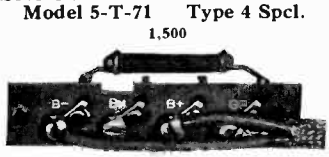
Connect White Wire to Relay. Black Wire to Grounded Battery Post

Crosley Model 95 — **Eliminator Type 4**

Remove Resistors

Connect "A" Hot of Radio Set to Relay

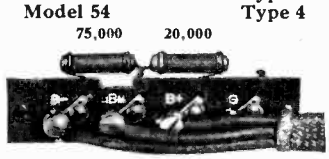
Motorola Model 5-T-71 — **Eliminator Type 4 Spcl.**



White Red Shield

Connect Two 8 MFD. 275 Volt Elkon Condensers Across the Output (B - to B +)
Connect Red Wire to Relay

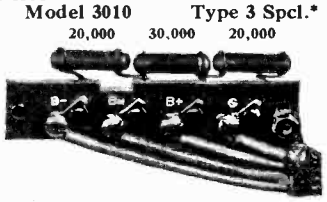
Colonial Model 53 — **Eliminator Type 5**
Model 54 — **Type 4**



Black Yellow Red

Connect White Wire to Relay—Black Wire to Grounded Battery Post

Delco Model 3010 — **Eliminator Type 3 Spcl.* †**



Yellow Maroon Black Red
Red Tr.

Connect Black and Yellow Wire from Radio Set to "A" Choke. "A" Choke to Relay

Philco Model 3 — **Eliminator Type 6**

Remove Resistors

Green-White Blue-White

Connect Black-White Wire to "A" Choke. "A" Choke to Relay

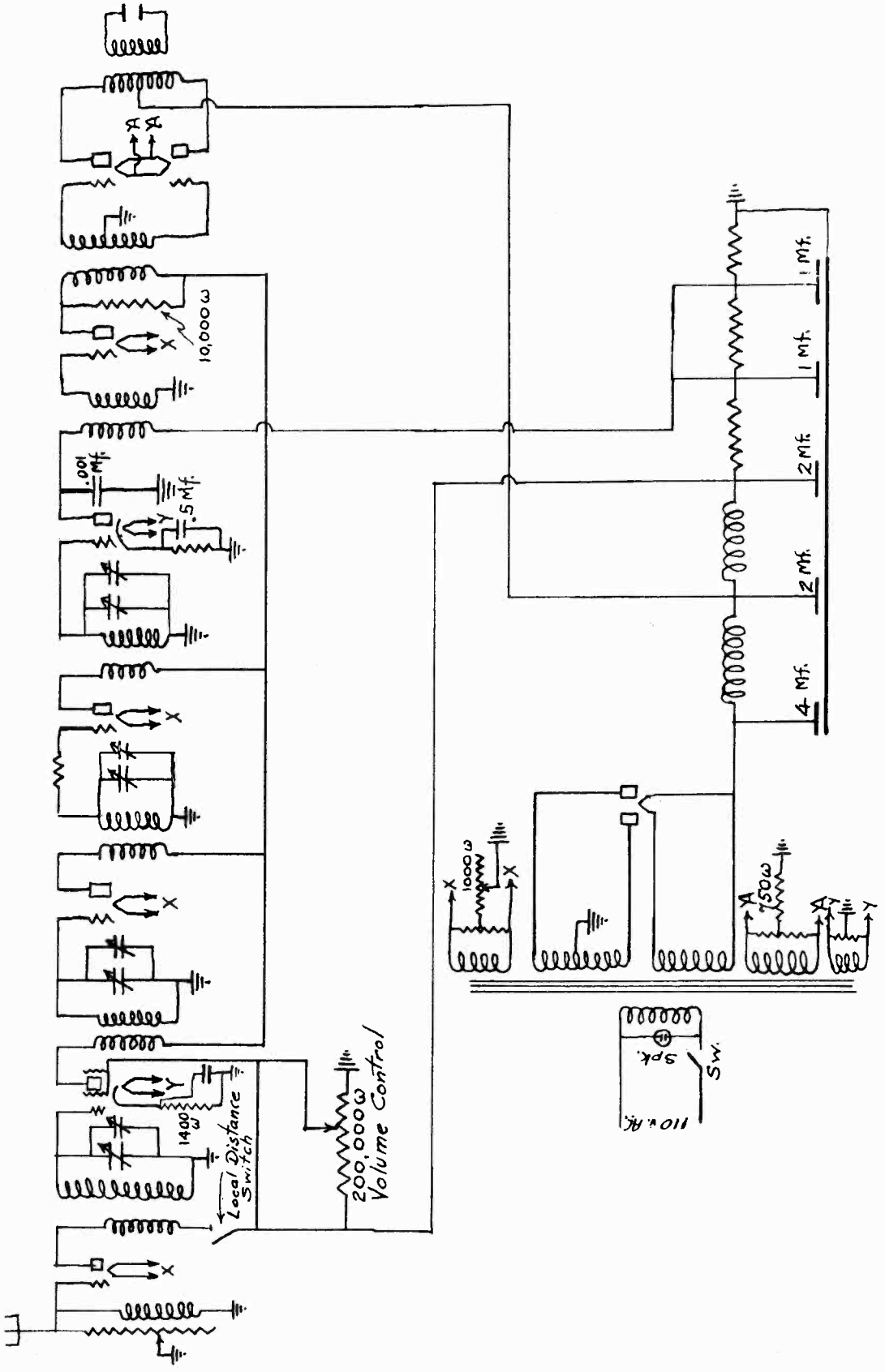
*Remove wire leading to "G" terminal. Move wire fastened to "B+" terminal to "G" terminal, making the "G" terminal, B+. Install resistors as shown.

†If shielded "B" cable is used remove the rivet from the right end of the terminal strip and replace with screw and nuts.

Fasten shield to bolt.

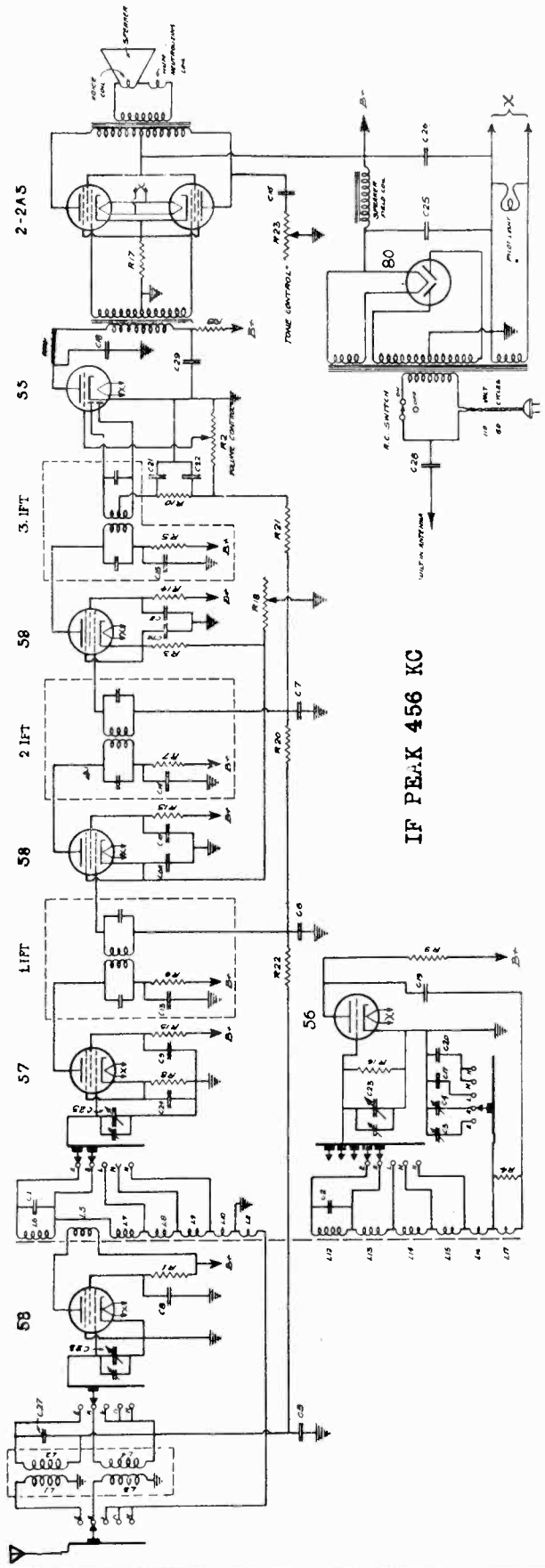
MODEL Miraco 1SG-226

MID-WEST RADIO CORP.



MODEL RT-9, G-9,
F-9, H-9
(9-34)
Schematic

MID-WEST RADIO CORP.



MID-WEST RADIO CORP.

MODEL RT-16, A-16, B-16, D-16, PR-16, RM-16 (16-34)

Schematic

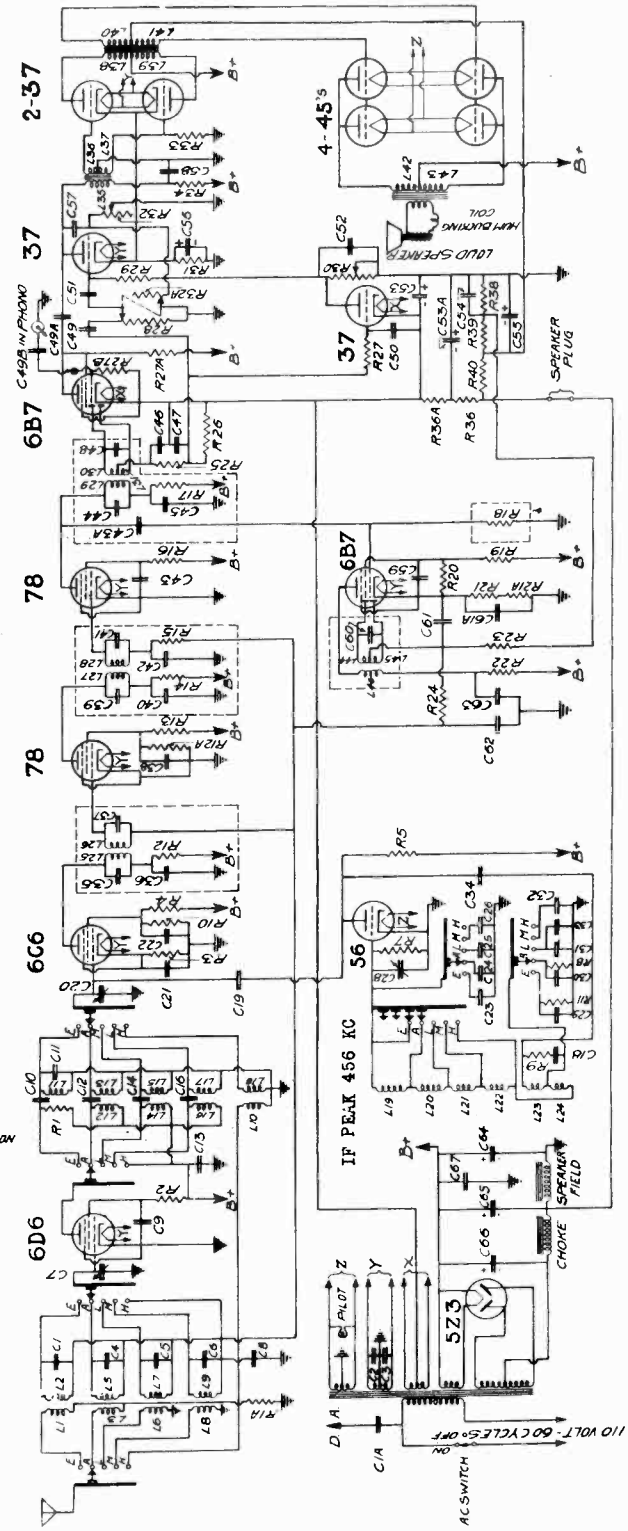
THE MIDWEST RADIO CORP. 909 BROADWAY CINCINNATI, OHIO.

SCHEMATIC CIRCUIT DIAGRAM OF THE MODEL 16-34 SET

DRAWN FSCH SEPT 14 1933.
TRACED FSCH OCT 10 1933
CHECKED R.S. OCT 19 1933
APPROVED W.A.S. OCT 19 1933

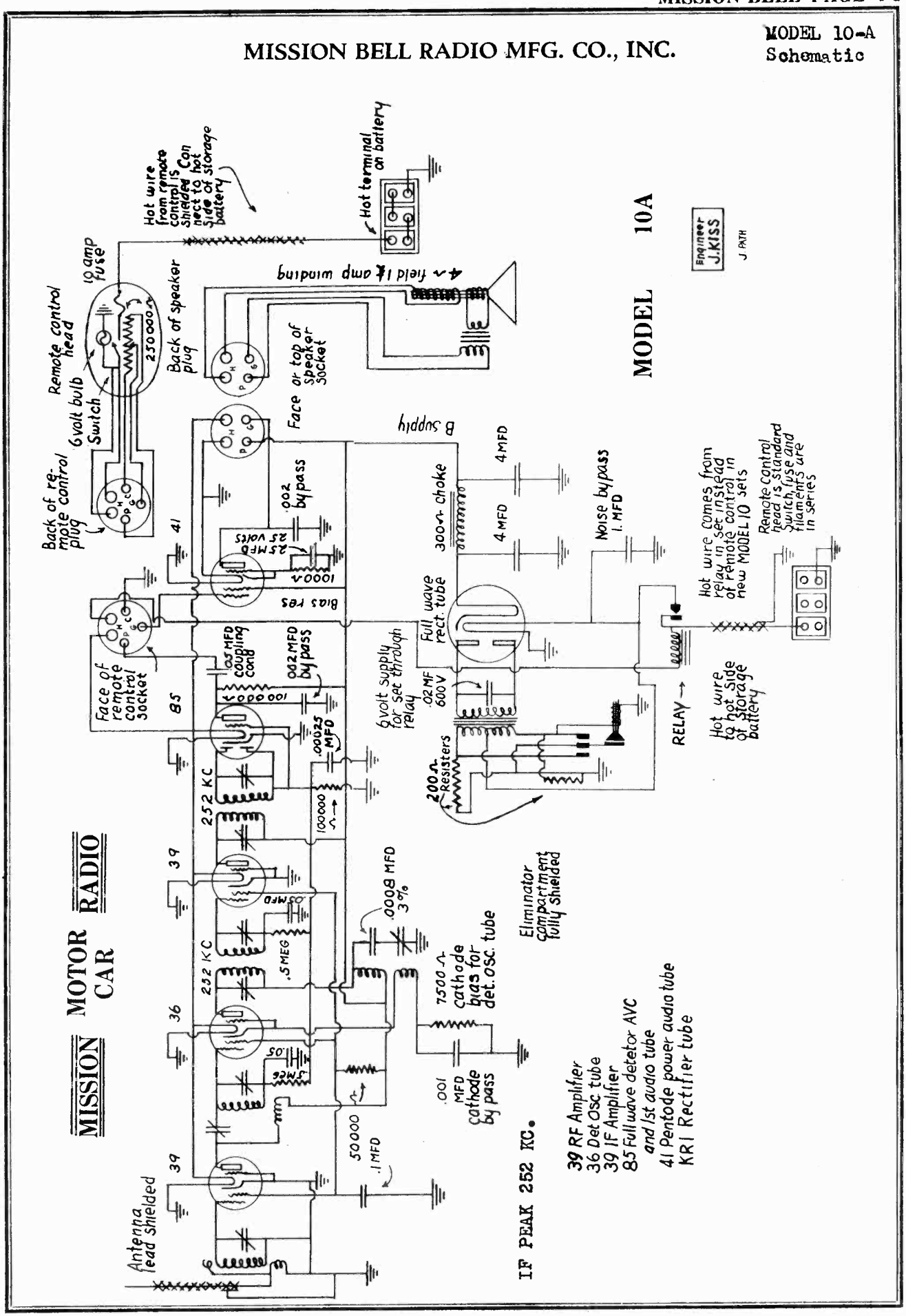
C1A	250	MMFD	MICA
C1	80	"	TRIMMER
C2	.05	MFD	200 VOLT
C3	.05	"	200 "
C4	20	MMFD	TRIMMER
C5	20	"	"
C6	20	"	"
C7	365	"	TUNING CONDENSER
C8	.05	MFD	200 VOLT
C9	.05	"	400 "
C10	25	MMFD	MICA
C11	80	"	TRIMMER
C12	20	"	"
C13	.05	MFD	400 VOLT
C14	20	MMFD	TRIMMER
C15	20	"	"
C18	25	"	MICA
C19	20	"	TRIMMER
C20	365	"	TUNING CONDENSER
C21	.05	MFD	200 VOLT
C22	.05	"	200 "
C23	80	MMFD	TRIMMER
C24	20	"	"
C25	20	"	"
C26	20	"	"
C28	365	"	TUNING CONDENSER
C29	160	"	PADDER
C30	360	"	"
C31	700	"	"
C32	5000	"	MICA
C33	500	"	"
C34	2000	"	"
C35	I.F.T.		TRIMMER
C36	.05	MFD	400 VOLT
C37	I.F.T.		TRIMMER
C38	.25	MFD	400 VOLT
C39	I.F.T.		TRIMMER
C40	.05	MFD	400 VOLT
C41	I.F.T.		TRIMMER
C42	.05	MFD	200 VOLT
C43	.05	"	400 "
C43A	25	MMFD	MICA
C44	I.F.T.		TRIMMER
C45	.05	MFD	400 VOLT
C46	250	MMFD	MICA } DUAL
C47	250	"	MICA } DUAL
C48	I.F.T.		TRIMMER
C49	.05	MFD	200 VOLT
C49A	.05	"	400 "
C49B	.05	"	200 " IN PHONO
C50	.05	"	200 "
C51	.05	"	200 "
C52	.01	"	200 "
C53	25	"	50 "
C53A	10	"	75 "
C54	.05	"	200 "
C55	25	"	50 "
C56	12	"	25 "
C57	.05	"	400 "
C58	1	"	300 "
C59	.05	"	400 "
C60	I.F.T.		TRIMMER
C61	.001	MFD	600 VOLT
C61A	.05	"	200 "
C62	.001	"	600 "
C63	.05	"	400 "
C64	8	"	ELECTROLYTIC
C65	8	"	"
C66	8	"	"
C67	.25	"	400 VOLT

R1A	5 000	.25	WATT
R1	75 000	.25	"
R2	200 000	.25	"
R3	5 000	.25	"
R4	50 000	.50	"
R5	15 000	1	"
R7	500 000	.25	"
R8	200 000	.25	"
R9	1 000	.25	"
R10	10 000	.25	"
R11	50 000	.25	"
R12	5 000	.25	"
R12A	100 000	.25	"
R13	200 000	.25	"
R14	5 000	.25	"
R15	3 MEG	.25	"
R16	200 000	.25	"
R17	5 000	.25	"
R18	3 MEG	.25	"
R19	26 000	.5	"
R20	50 000	.8	"
R21	4 000	.25	"
R21A	4 000	.25	"
R22	5 000	.25	"
R23	500 000	.25	"
R24	100 000	.25	"
R25	100 000	.25	"
R26	500 000	.25	"
R27	500 000	.25	"
R27A	500 000	.5	"
R27B	100 000	.25	"
R28	500 000		POT. VOLUME CONTROL
R29	500 000	.25	WATT
R30	50 000		POT-STAT-O-MAT CONTROL
R31	700		1" FLEXIBLE
R32	50 000		VARIABLE TONE CONTROL
R32A	50 000		AUTOMATIC TONE COMPENSATION
R33	10 000	.25	WATT
R34	15 000	1	"
R36	25 000	.25	"
R36A	25 000	.25	"
R38	10 000	.25	"
R39	100 000	.25	"
R40	50 000	.25	"



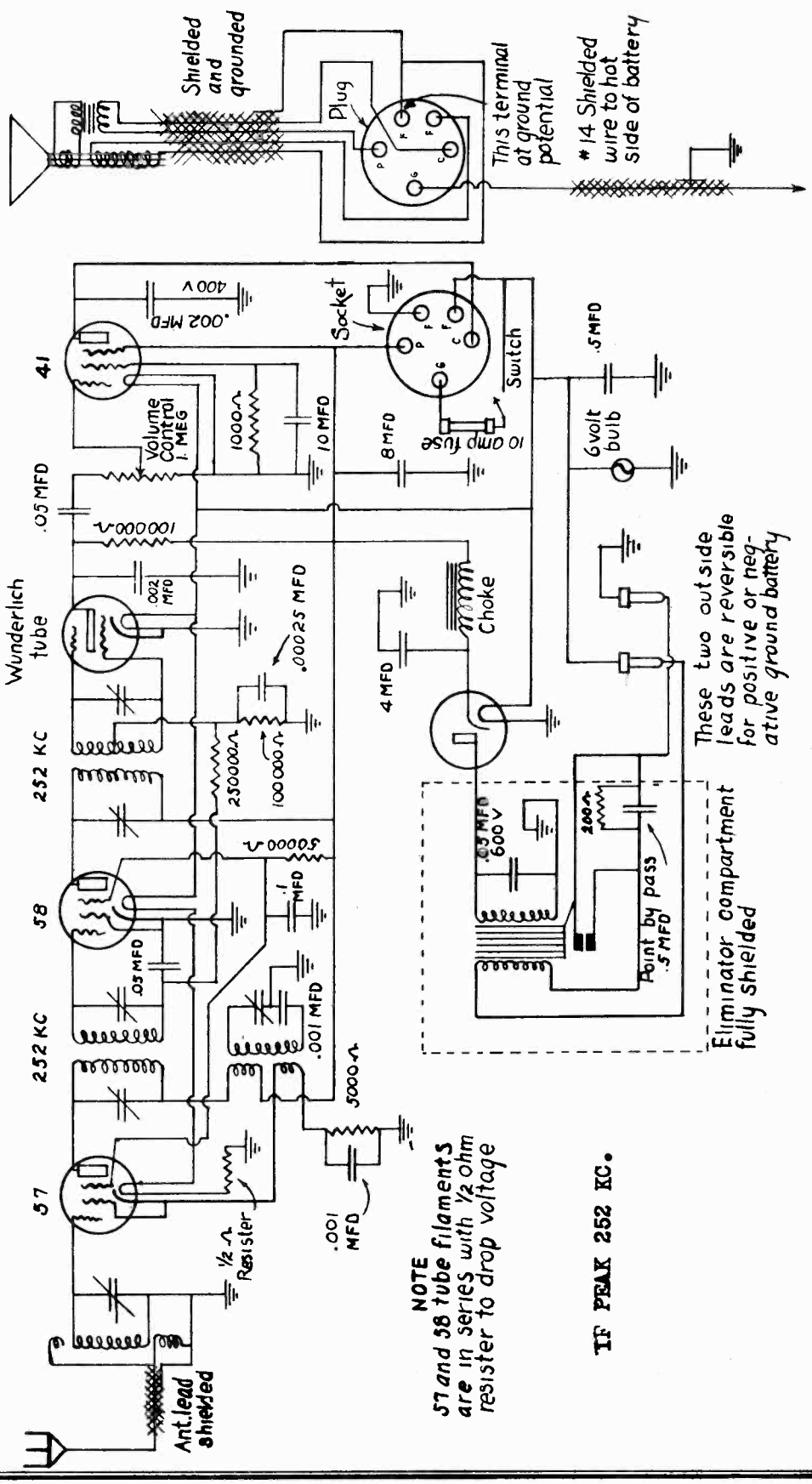
MISSION BELL RADIO MFG. CO., INC.

MODEL 10-A
Schematic



MODEL 19,19-A
Schematic

MISSION BELL RADIO MFG. CO., INC.



MISSION MOTOR CAR RADIO

MODEL 19 AND 19A

NOTE
57 and 58 tube filaments are in series with ½ ohm resister to drop voltage

IF PEAK 252 KC.

Mission Bell Radio Mfg. Inc.
1455 Venice Blvd., Los Angeles

SERVICE DATA ON FULL-WAVE INTERRUPTOR

****

An O to 5 Ammeter is absolutely necessary in servicing.
The Model 10A and 19-A and Model 5 should draw approximately 5½ to 5¾ amps. There is no voltage regulator, Your reading of output voltage can be secured most conveniently from the adjusting screws on top of intermediate frequency coil.
If the set draws 5½ to 5¾ amps. with no resulting output voltage, then check AC volts from transformer. Test rectifier tube - a shorted filter condenser will increase the drain approximately 2 amps. A shorted buffer condenser will increase drain 5 amps. Either of which cause the points to labor and heat up. Visually, this is indicated by excessive arc-ing and small movement of armature (weight on end of center spring). Shorted rectifier tube will show 8 amps short.
If transformer primary is shorted, due to contact points failing to move apart, you will receive a reading of from 18 to 26 amps - which will blow the fuse inside the set on Model 10A, 19A and 5, or in remote control on Model 19B. Usually, tightening the 2 6/32 nuts on the assembly, or giving the inside point next to the starting coil a gap of ten thousandths (.010), either by bending metal stop to push the points apart, or bending spring stock away from center point is all that is necessary.

If above conditions are normal and the vibrator fails to start, the points are spaced too far apart, or the armature is too far from the magnet or core - providing you have battery voltage to the points.

Bench Adjustment:- Weight on center spring (call Armature) should not be closer than 1/8" to magnet or core. The copper rivet fastening weight to spring should keep the weight from touching the core. The outside point should have a tension of not more than five thousandths (.005). The inside point should be open about eight to twelve thousandths (.008 to.012). The main consideration is to secure as wide a spacing as possible on the inside point, and yet not so wide that when set is turned off and on continuously there would be failure to start (or point make contact). It is also satisfactory to adjust so that the outside point has a small gap - but a closed contact on the outside point will assist in starting.

Adjustment of Interruptor of Open Frame Type: -(This frame is not a closed or complete rectangle). If the points work vigorously, of if the weight is pulled all the way to the core when switch is turned on, it is advisable to bend the frame to bring the weight farther away from the magnet. This can be accomplished with a large pair of pliars. If the weight is too far away and magnet will not pull weight down enough to contact lower point, bend opposite way. In either operation make the bend at the top end of frame. Other spacing and adjustments same as above directed.

ADJUSTMENT HALF-WAVE POINTS MODEL 10

****

Battery voltage should be not less than 5½ volts at terminals on the outside of Junction Block. (This is the small fiber strip attached to the side of Eliminator Box).
Put an O to 5 Ammeter in series with the hot or ungrounded wire on the Junction Block.

Second: - The lower spring should rest close to the transformer, 1/32 of an inch, no more, above the transformer. The lamentations at the groove should be level, and can be made so by tapping with a hammer. When installing a new assembly, see that adjusting screw does not touch the transformer until the point assembly is securely fastened down. On new assemblies as received from the factory, noto carefullythe tension and movement of the points, in case it should be necessary to bend the lower spring to secure right distance from transformer - you can then bend the upper spring enough to get this same tension again.

Third:-It is absolutely necessary to have an ammeter hooked in series with the hot wire on junction block, as the input voltage reading should never exceed a maximum of more than 2 amps. This voltage and also the output voltage can be regulated to some extent with the adjusting screw. If the points should be drawing more than two amps, they will get hot and pit and burn.
Fourth:- The tension on the top point is very important. These should be adjusted for maximum swing or up and down movement of both points when in operation.

Fifth:-With lower point adjusted to 1/32" from transformer, the upper spring should have enough tension to follow mor move down approximately 30/1000ths as the lower spring is pulled down to the core or lamentations. There should be a ± 30/1000ths gap between the points when the lower point reaches its maximum downward movement. Either decreasing or increasing the tension of the springs regulates the INPUT and OUTPUT VOLTAGE. The output voltage can be secured most conveniently from the upright intermediate frequency coil. One of the brass screws is B positive - B negative being the ground.

NOTE:-In case the negative of the car storage battery is grounded, then you must make the same polarity hook-up on the bench. Should the set be changed from a negative grounded car to a positive grounded car, then the two wires on the outside, and the same side of the junction block, must be reversed.
Should the points have been run backwards from hooking up wrong polarity, a few strokes of a thin file between the points will remove excess metal on surface of points, and then can be re-adjusted - unless they have been so hot that the temper is out of the metal.
To bend the springs use long nose pliars at the back end of spring, twisting either down or up, depending on desired effect.

Discussion of R. F. DISTURBANCE IN RELATION TO GROUNDS.

With reference to R. F. noise or diaturbance created by the interruptor or eliminator, as applied to demonstrating boards and bench installation for testing and demonstrating.

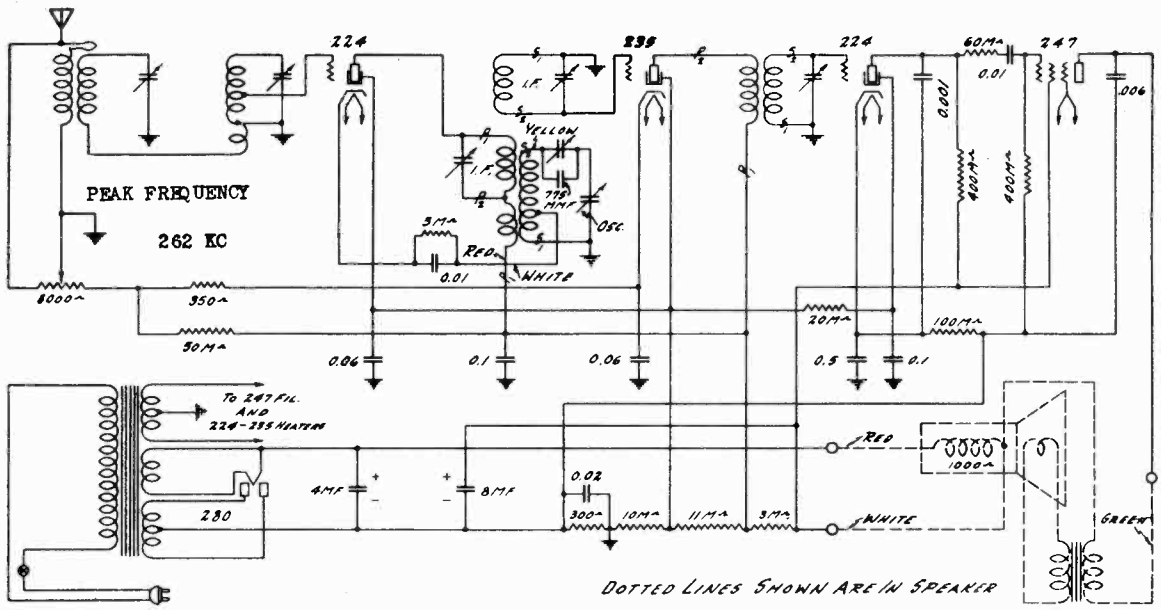
Inasmuch as all transmitting stations use a good ground or counterpoise ground to properly dissipate R.F. energy - and the best of the receiving systems employ good ground or counter-poise for proper reception - it is quite evident that when a set of this nature is hooked up on a display board or on the bench, that the chassis or set connected to the battery or to the shielded cable forms a very poor ground - especially when the source of the interference is located inside of the set. Therefore, if proper dissipation of the R.F. disturbance is not provided in the form of a ground, the antenna will pick up considerable interference from the set, battery and battery leads.

For installation on boards and bench testing, it has been found, after exhaustive tests, that a ground must be provided in the form of an outside type, or one of counter-poise effect constructed sufficient to offset the antenna pickup of this interference. An antenna of from three feet not to exceed ten feet is recommended, as it is generally possible to secure an outside ground sufficient to counteract this pickup of R.F. interference.

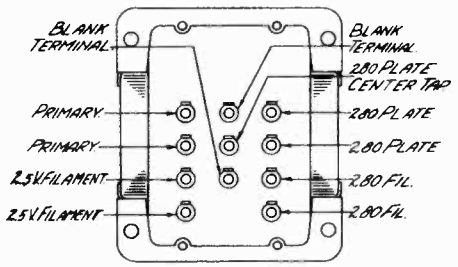
An automobile has proven to be one of the best counter-poise ground systems obtainable, and Mission Automobile Receivers have been designed for this type of ground system. The outside ground corresponds to the ground system in the car. The bolting of the receiver to the dash with the three studs gives considerably more ground effect than fastening an outside ground to one stud of the case when operating on the bench.
Do not confuse the car battery as your ground system; it is merely your six-volt source of supply. The car-frame, motor and body become a very large and efficient counter-poise ground - and being situated right under the antenna input , becomes the dissipating agency for the R.F. noise that is created by the interruptor. That is the reason that the antenna in the car does not pick up the R.F. interference when the set is properly mounted in the car - but the same set would, no doubt, appear to be producing considerable amount of R.F. on the bench.

MONTGOMERY-WARD & CO.

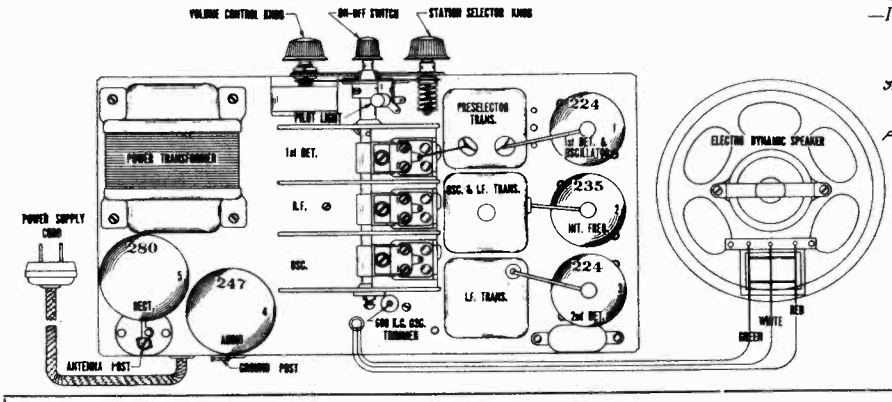
MODEL 13,15,16,16X, 17,18,18X

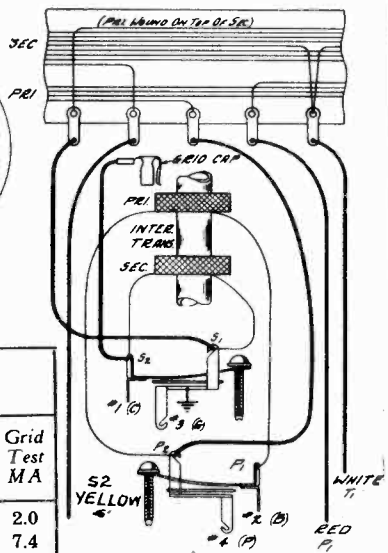


There are certain features to be noted in this receiver. The mixer is of the autodyne type, wherein it functions as a mixer (1st detector) and also as an oscillator. Also that the grid lead from the mixer tube joins the grid coil at a tap upon this winding. This tap is so apportioned that the circuit acts to suppress the transmission of image frequency signals, in this case 524 KC higher than the frequency setting of the tuned circuit. The IF transformer is also of special structure combining the coupling transformer and also the oscillator system.



—Power Transformer Terminals





Wiring Diagram, Osc. and I.F. Assembly

VOLTAGES AT SOCKETS

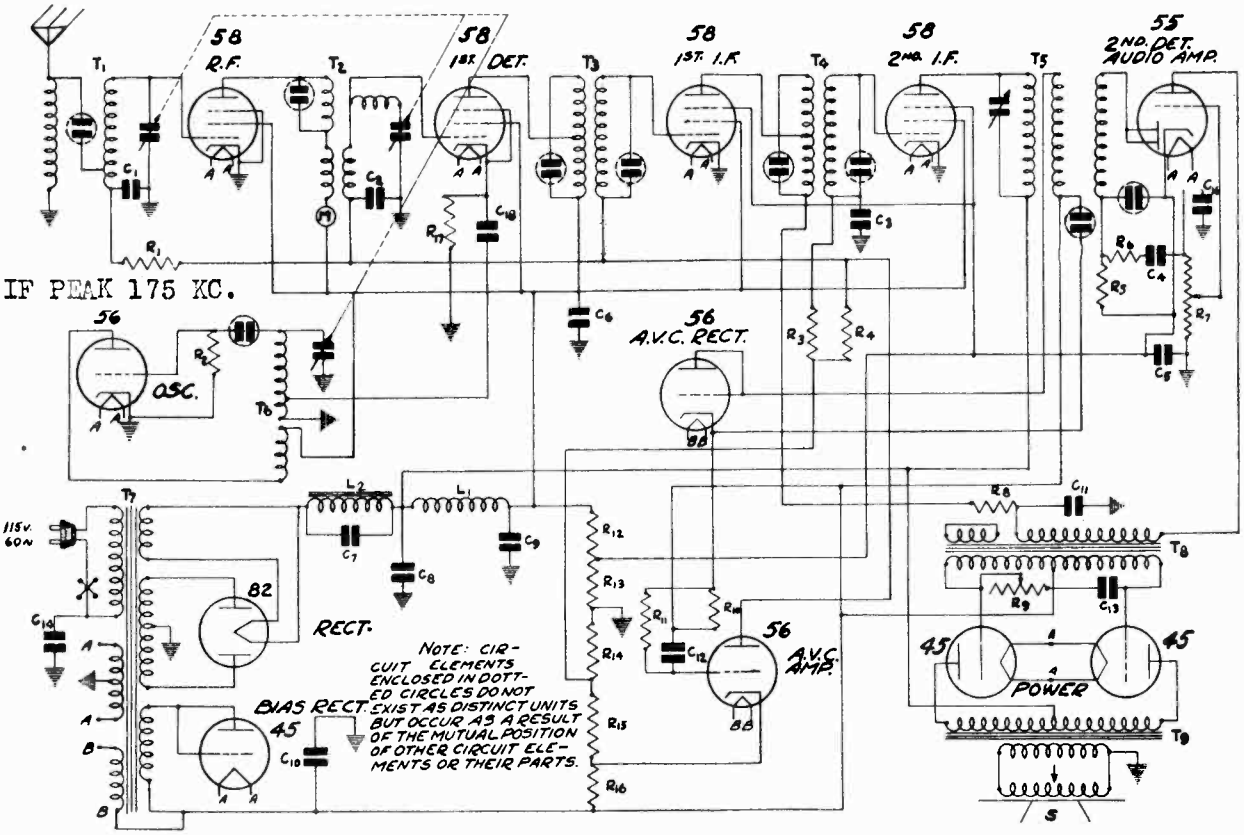
LINE VOLTAGE 115—VOLUME CONTROL AT MAXIMUM

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
224	1	1st Det. & Osc.	2.25	165	4.5–5.25(1)	65	.4	4.5–5.25(1)	1.3	2.0
235	2	I.F.	2.25	165	2.5	65	1.5	2.5	6.4	7.4
224	3	2nd Det.	2.25	128	6.5	60(2)	.05	6.5	.22	.23
247	4	Audio	2.25	205	16. (3)	225	8.0		29.	33.
280	5	Rect.	4.9						27. Per Plate	

(1) Varies with frequency setting of dial approximately as shown.
(2) Voltage as measured with 600,000 ohm meter.
(3) Measured across 300 ohm section of voltage divider resistor.

MODEL 62-89
Schematic, Socket Values

MONTGOMERY-WARD & CO.



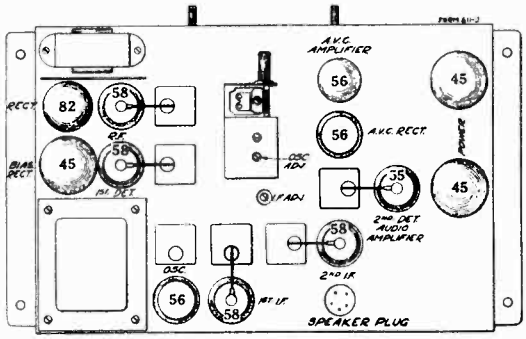
RESISTORS

Part No.	Code	Resistance	Type
P-A95204	R1	200,000 ohm	Carbon
P-A95504	R2	.5 megohm	Carbon
P-A95105	R3	1 megohm	Carbon
P-A95504	R4	.5 megohm	Carbon
P-B94803	R5	80,000 ohm	Carbon
P-A95104	R6	100,000 ohm	Carbon
P- 96005	R7	2 megohm	Vol. Con. & Switch
P-C94403	R8	40,000 ohm	Carbon
P- 97003	R9	3 megohm	Tone Control
P-A95204	R10	200,000 ohm	Carbon
P-A95105	R11	1 megohm	Carbon
P- 98003	R12	4000 ohm	Armoured Wire Wound
	R13	390 ohm	
P-A94902	R14	9,000 ohm	Carbon
P-A94154	R15	150,000 ohm	Carbon
P-A94353	R16	35,000 ohm	Carbon
P-A95352	R17	3,500 ohm	Carbon

"A" preceding the number signifies .2 watt
"B" preceding the number signifies .5 watt
"C" preceding the number signifies 1.0 watt

CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-80862	C1	.050 mfd.	200 V.	Tubular
P-80987	C2	.150 mfd.	200 V.	Tubular
P-80862	C3	.050 mfd.	200 V.	Tubular
P-80862	C4	.050 mfd.	200 V.	Tubular
P-80888	C5	.250 mfd.	200 V.	Tubular
P-80888	C6	.250 mfd.	200 V.	Tubular
P-80985	C7	.150 mfd.	200 V. AC	Tubular
P-80984	C8	16. mfd.	450 V.	Electrolytic Block
	C9	6. mfd.	150 V.	
	C10	8. mfd.	100 V.	
	C11	4. mfd.	350 V.	
	16 mfd. Section—Term. 3+, Term. 1−			
	6 mfd. Section—Term. 5+, Term. 1−			
	4 mfd. Section—Term. 4+, Term. 1−			
	8 mfd. Section—Term. 6+, Term. 2−			
P-80862	C12	.050 mfd.	200 V.	Tubular
P-80863	C13	.004 mfd.	600 V.	Tubular
P-80997	C14	.010 mfd.	600 V.	Metal Can
P-80919	C16	.00025 mfd.	600 V.	Moulded
P-80914	C18	.002 mfd.	200 V.	Tubular
P-80991	3 Gang Condenser			
P-1922	3rd I. F. Trimmer Condenser			



Tube Arrangement

MONTGOMERY-WARD & CO.

MODEL 62-89
Voltage data
Alignment

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide an accurately calibrated signal of 175 K. C. and accurately calibrated signals over the broadcast band, and an output indicating meter are desirable. The procedure is as follows:

Set the signal generator for 175 K. C. Connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. Then adjust the 3rd I. F. primary condenser for maximum output. The adjusting screw for this condenser is reached from the top of the sub-panel and will be seen in back of the tuning condenser.

Next set the signal generator for a signal of exactly 1400 K. C. The antenna lead from the signal generator is, in this instance, connected to the antenna lead of the receiver. Set the dial pointer on the 1400 K. C. mark on the dial scale and adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator trimmer first.

The tuning condensers are all adjusted at the factory for the correct relative capacity between the oscillator section and the other two sections. As a rule no adjustment other than at 1400 K. C., as mentioned above, is required. If, after the receiver has been aligned at 1400 K. C., the sensitivity is still low at some portion of the band, adjust the signal generator to that setting and tune for maximum output with the station selector knob on the receiver. Then, without readjusting the trimmers, bend the slotted rotor plates on the **front two sections** of the gang to obtain maximum output. Care should be taken not to bend these plates too far in an inward direction as the condenser may short as a result.

After any adjustment of this nature, set the signal generator again for a signal of 1400 K. C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Caution

Never operate the receiver with the bias rectifier tube out of the socket. When this condition exists all of the tubes which secure bias voltage from the action of this tube will be operating without bias voltage and as a result, excessive plate current will flow. In the case of the 45 output tubes, the very high plate current may ruin these tubes completely.

Replacing Rubber Drive Pinion

The vernier tuning drive on this chassis uses a rubber pinion. Under normal operating conditions, this rubber will last for a number of years. Should it become worn it can be replaced as follows:

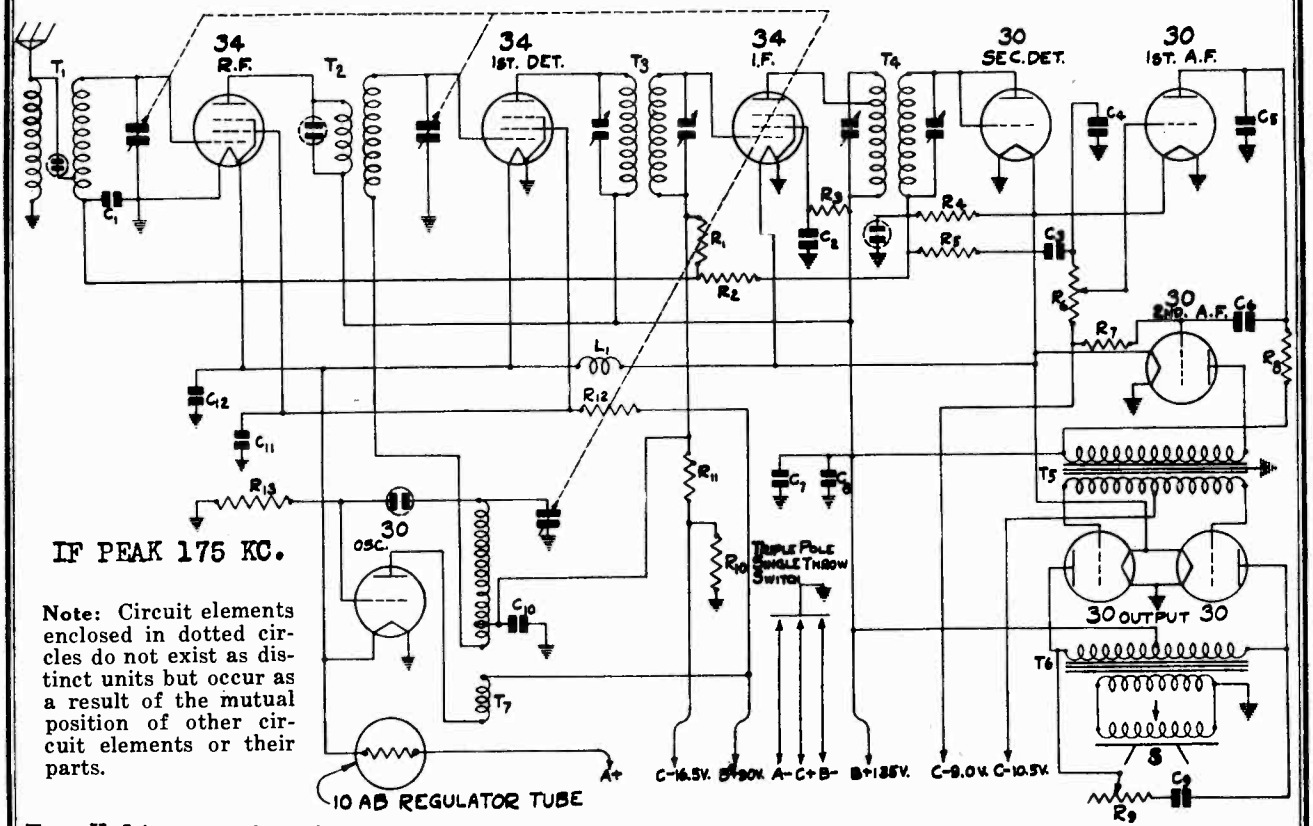
Loosen the set screw of the brass drive bushing and also the retaining screw on the station selector shaft end bearing which is attached to the tuning condenser. Then pull out the station selector shaft. Pull the old rubber pinion off of the brass bushing and put the new one on. The rubber pinion fits tight. Next slip the station selector shaft back in position through the bushing and tighten the two screws.

TYPE	FUNCTION	Fil-Htr. Volts	Plate to Cathode	Screen to Cathode	Cont.Grid to Cath.	Supp.Grid to Cath.	Plate MA
58	R.F.	2.5	116	122	4.5*	--	7.5
58	1st Det.	2.5	112	112	13.0**	--	2.2
56	Osc.	2.5	122	--	0	--	5.0
58	1st I.F.	2.5	405	120	4.5*	13	8.0
58	2nd I.F.	2.5	405	120	4.5*	13	8.0
56	AVC Rect.	2.5	0	-	-	--	0
56	AVC Ampl.	2.5	75°	-	17.0 z	--	0
55	2nd Det.	2.5	160°°	-	13.0 x	--	5
45	Power	2.5	405	-	103.0	--	22
45	Bias Rect	2.5	105	-	---	--	0.5
82	Rect.	2.5	1040 v. AC plate to plate				52 per plate

* As read across R-14
** As read across R-17 and R-14
° As read across R-15 with 1,000,000-ohm meter
°° As read across R-16
z Triode plate to cathode
x Volume control at minimum

MODEL 62-91
Schematic, Values
Socket layout

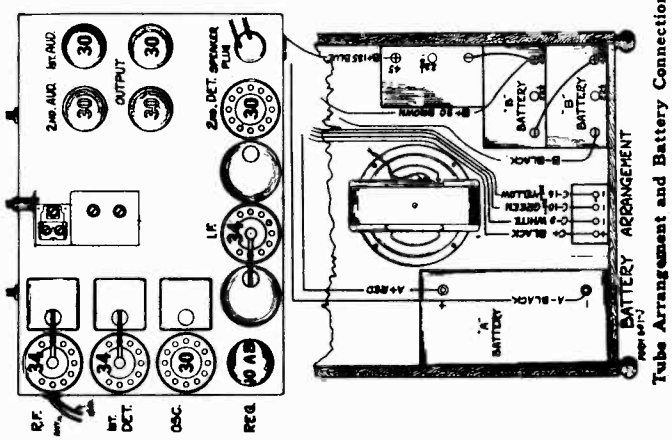
MONTGOMERY-WARD & CO.



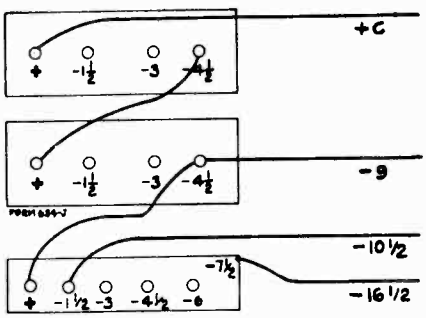
IF PEAK 175 KC.

Note: Circuit elements enclosed in dotted circles do not exist as distinct units but occur as a result of the mutual position of other circuit elements or their parts.

For Voltage and Alignment Data, see Index



Tube Arrangement and Battery Connections



Optional "C" Battery Connections

CONDENSERS

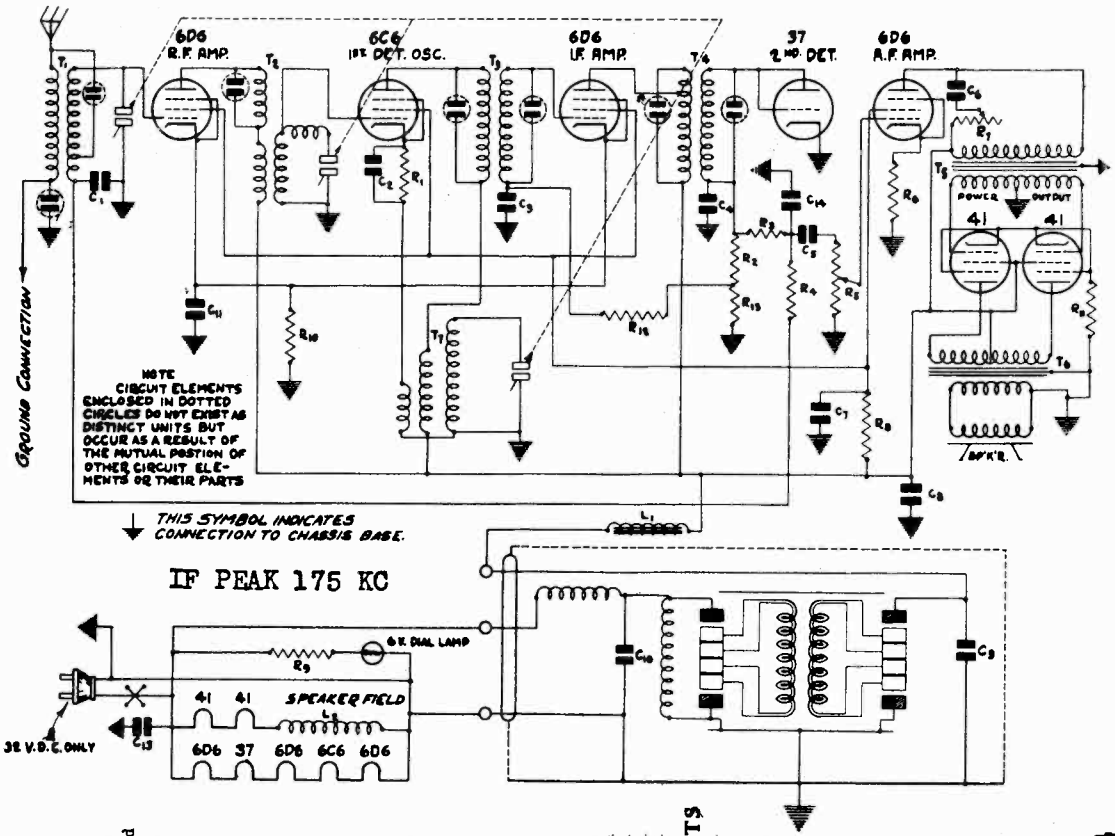
Part No.	Code	Capacity	Voltage	Type
P-80864	C1	.10 mfd.	200 V.	Tubular
P-80862	C2	.050 mfd.	200 V.	Tubular
P-80862	C3	.050 mfd.	200 V.	Tubular
P-80919	C4	.00025 mfd.	600 V.	Moulded
P-80919	C5	.00025 mfd.	600 V.	Moulded
P-80862	C6	.050 mfd.	200 V.	Tubular
P-80968	C7	4.00 mfd.	150 V.	Electrolytic
P-80862	C8	.050 mfd.	200 V.	Tubular
P-80940	C9	.02 mfd.	400 V.	Tubular
P-80981	C10	.01 mfd.	400 V.	Tubular
P-80888	C11	.25 mfd.	200 V.	Tubular
P-80888	C12	.25 mfd.	200 V.	Tubular
P-80980	Three Gang Variable Condenser			

RESISTORS

Part No.	Code	Resistance	Type
P-A95504	R1	.5 megohm	Carbon
P-A94105	R2	1.0 megohm	Carbon
P-A95853	R3	85,000 ohms	Carbon
P-A94204	R4	200,000 ohms	Carbon
P-A95104	R5	100,000 ohms	Carbon
P- 96009	R6	1 megohm	Volume Control
P-A94105	R7	1 megohm	Carbon
P-A95104	R8	100,000 ohms	Carbon
P- 97001	R9	150,000 ohms	Tone Control
P-A94153	R10	15,000 ohms	Carbon
P-A94405	R11	4 megohms	Carbon
P-A94153	R12	15,000 ohms	Carbon
P-A95504	R13	.5 megohm	Carbon

MONTGOMERY-WARD & CO.

MODEL 62-93
Schematic, Voltage, Socket layout



RESISTORS

Part No.	Code	Resistance	Type
P-A93452	R1	4,500 ohm	Carbon
P-A94154	R2	150,000 ohm	Carbon
P-A95104	R3	100,000 ohm	Carbon
P-A95205	R4	2 megohm	Carbon
P- 96004	R5	1 megohm	Volume Control
P-A95102	R6	1,000 ohm	Carbon
P- 97002	R7	40,000 ohm	Tone Control
P-B93203	R8	20,000 ohm	Carbon
P- 91053	R9	144 ohm }	Armoured Wire Wound
	R11	340 ohm }	
P-A94201	R10	200 ohm	Carbon
P-A95105	R12	1 megohm	Carbon
P-A94503	R13	50,000 ohm	Carbon

"A" preceding the number signifies .2 watt
"B" preceding the number signifies .5 watt
"C" preceding the number signifies 1.0 watt

CONDENSERS

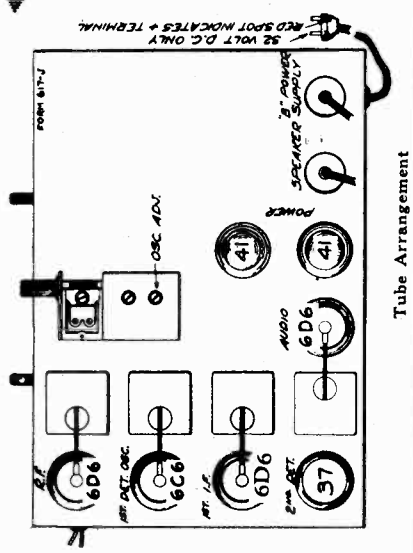
Part No.	Code	Capacity	Voltage	Type
P-80862	C1	.050 mfd.	200 V.	Tubular
P-80914	C2	.002 mfd.	600 V.	Tubular
P-80862	C3	.050 mfd.	200 V.	Tubular
P-80919	C4	.250 mmf.	600 V.	Moulded
P-80862	C5	.050 mfd.	200 V.	Tubular
P-80862	C6	.050 mfd.	200 V.	Tubular
P-80988	C7	1.50 mfd.	140 V.	Tubular
P-80989	C8	8.00 mfd.	250 V.	Electrolytic
P-80887A	C11	.10 mfd.	400 V.	Tubular
P-80974	C13	.50 mfd.	120 V.	Tubular
P-80919	C14	.250 mmf.	600 V.	Moulded
P-80980		3 Gang Condenser		

"B" POWER UNIT PARTS

Part No.	
P-60680	"A" Choke Coil L3
P-70735	Cable and Plug
P-10272	Rubber Mtg. Feet
P-80925	C9 .25 mfd. 300 V. Tubular Condenser
P-80974	C10 .50 mfd. 120 V. Tubular Condenser
P-1908	32 Volt Dynamotor Complete

INTERFERENCE ELIMINATION PARTS

Part No.	
62-5424	Spark Plug Suppressor
P-80933	Dual .5 mfd. Generator Condenser



Tube Arrangement

TYPE	FUNCTION	Heater Volts	Plate to Cathode	Screen to Cathode	Grid to Cathode	Plate MA
6D6	R.F.	6.4	190	96	3.0*	7.5
6C6	1st Det-Osc.	6.4	185	91	7.0	1.6
6D6	I.F.	6.4	190	96	3.0*	7.5
37	2nd Det.	6.4	0	—	0	0
6D6	1st A.F.	6.4	170	94	4.8*	5.0
41	Output	6.4	175	177	14.0	18.0

* Cathode to ground

For Noise Elimination Data, see Index

MODEL 62-93
Noise Elimination
MODEL 77, 95
Alignment

MONTGOMERY-WARD & CO.

MODEL 62-93

Eliminating Ignition and Generator Noise

After the receiver is in working order, the following procedure must be followed in practically all cases to eliminate ignition and generator noise caused by the charging plant. If the charging plant causes no noise, then of course, these steps do not have to be taken.

One spark plug suppressor must be placed on each spark plug of the engine. One spark plug for example would be required on a one-cylinder engine and four must be used on a four-cylinder engine. To connect the spark plug suppressor, remove the wire from the top of the plug, put the suppressor on and attach the wire to the other end of the suppressor.

The generator condenser consists of two .5 mfd. sections in one unit. The two sections have one side grounded to the metal case of the condenser. Mount the condenser on the frame of the charging plant. This will ground it. Then connect the two leads to the charging switch, one on each side of the line.

In some large installations, where the charging unit is on only two or three times a week, the above steps do not have to be taken, as interference is only caused when the generating plant is in operation.

If the reception is noisy only when the generating plant is in operation, then the noise is due to the latter and several things can be done. There may be loose parts in the generator plant rubbing together. Tighten up all parts and be sure that all parts of the engine are well grounded. Dirty spark plugs may cause noise. Clean and respace the plugs or try out a new set. In some instances it may be necessary to filter the power supply line to the receiver.

If any motor driven devices, such as pumps, are operated from the 32 volt line, the motor may cause noisy reception in the receiver. This can be corrected in most cases by connecting one of the dual .5 mfd. condensers mentioned above across the line at the motor. The common connection to the two condensers which is grounded to the can is grounded externally by mounting the unit on the motor or on a nearby point which is well grounded.

A faulty "B" unit may cause noisy operation. This will manifest itself as a low frequency hum or as an R. F. noise. The choke and condensers in the power unit box can be tested and replaced if necessary. The noise may be due to some cause in the dynamotor itself such as improperly seated brushes, and, if this is the case, the entire power unit box should be returned for repairs or replacement. Substitution of 200 volts from a "B" battery source for the "B" power unit will determine if the latter is causing noisy operation.

Noise Due to Antenna Location. *Run the antenna at right angles to any 32 volt lines and keep it as far away from these lines as possible,* in order to avoid line noise being carried into the set via the antenna. In all cases of noise, disconnect the antenna from the set. If the noise is still present, it is probably in the receiver, dynamotor or 32 volt lines. If the noise disappears when the antenna is disconnected, it is being brought in on the antenna or lead-in and these should be changed to another location.

The 41 Tubes Do Not Light. The filaments of the two 41 tubes and the speaker field are in series across the 32 volt line. If either of the 41 tubes is out of the socket or has an open filament, or if the speaker plug is not inserted, neither of the 41 tubes will light.

MODELS 77,95

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and an output indicating meter are advisable. The procedure is as follows:

As the I.F. stages are self-tuned, no I.F. aligning at the intermediate frequency of 175 K.C. is required.

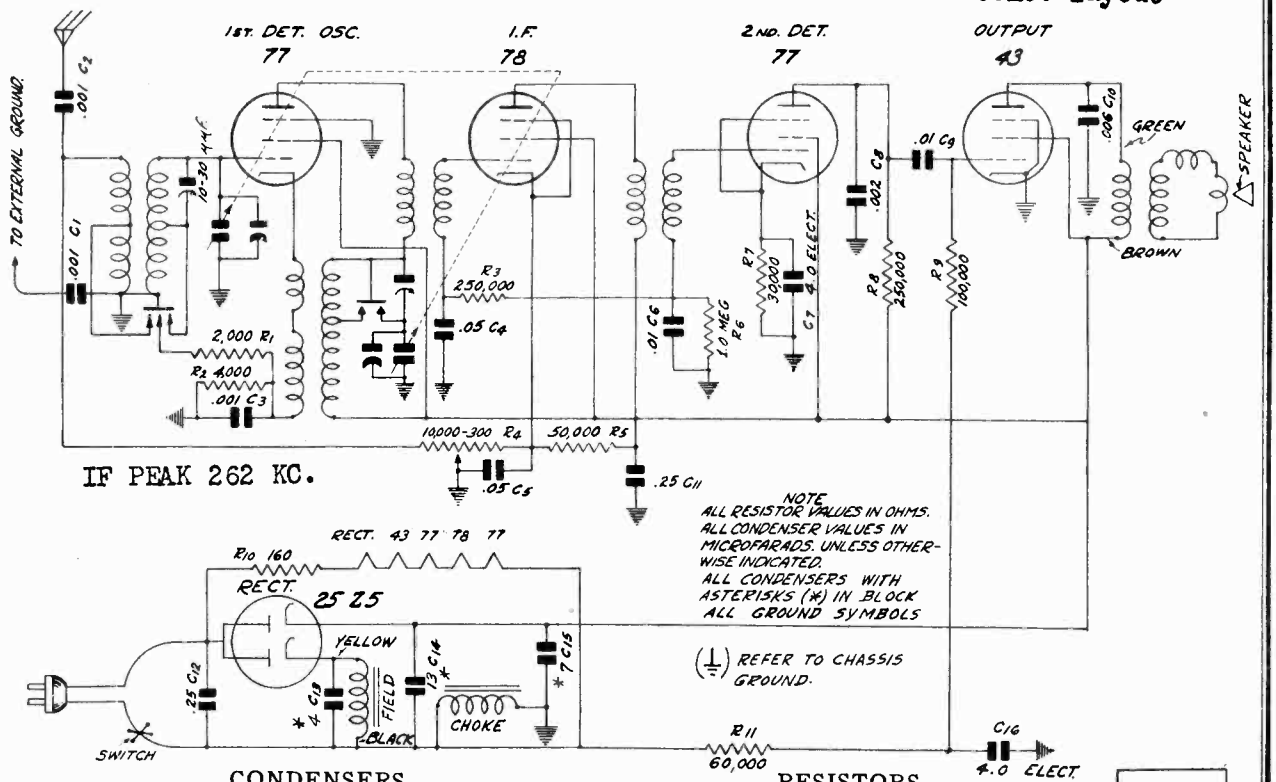
First set the signal generator for a signal of exactly 1400 K.C. Connect the antenna lead from the signal generator to the antenna lead of the receiver and the ground lead of the signal generator to the ground of the receiver. Then turn the tuning condenser rotor until the marker is at 1400 K.C. on the dial scale. Adjust the two trimmers on the tuning condenser for maximum output adjusting the oscillator trimmer first.

Next set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The adjusting screw will be seen at the side of the tuning condenser and is reached from the top of the chassis. A non-metallic screw-driver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

MONTGOMERY-WARD & CO.

MODEL 62-96
Schematic, Voltage
Socket layout

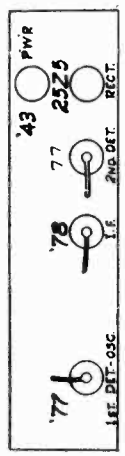


CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-80821-B	C-1	.001 mfd.	600 V.	Moulded
P-80821-B	C-2	.001 "	600 V.	Moulded
P-80905-A	C-3	.001 "	400 V.	Tubular
P-80862-C	C-4	.05 "	200 V.	Tubular
P-80862-C	C-5	.05 "	200 V.	Tubular
P-80872-B	C-6	.01 "	600 V.	Tubular
P-80936-C	C-7	4.0 "	30 V.	Efectrolytic
P-80914	C-8	.002 "	600 V.	Tubular
P-80872-B	C-9	.01 "	600 V.	Tubular
P-80898	C-10	.006 "	600 V.	Tubular
P-80888-A	C-11	.25 "	200 V.	Tubular
P-80888-A	C-12	.25 "	200 V.	Tubular
P-80944	C-13	4.0 "	150	Elec. Block
	C-14	13.0 "	150	
	C-15	7.0 "	150	
P-80878-C	C-16	4.0 "	150 V.	Electrolytic
P-1539	600 K.C. Trimmer Cond.			
P-80951	Short-wave antenna Trimmer			
P-80943	2-gang Cond.—Direct Drive (Used on early Sets)			
P-80954	2-gang Condenser—Gear Drive			

RESISTORS

Part No.	Code	Resistance	Type
P-A-90906	R-1	2,000 ohm	Carbon
P-A-90947	R-2	4,000 ohm	Carbon
P-A-90954	R-3	250,000 ohm	Carbon
P-91019C	R-4	300-10,000 ohm	Vol. Con. and Switch
P-A-90941	R-5	50,000 ohm	Carbon
P-A-90948	R-6	1 Megohm	Carbon
P-A-90956	R-7	30,000 ohm	Carbon
P-A-90954	R-8	250,000 ohm	Carbon
P-A-90912	R-9	100,000 ohm	Carbon
P-91064	R-10	160 ohm	Armored Wire Wound
P-A-91036	R-11	60,000 ohm	Carbon



Tube Arrangement

Voltages at Sockets

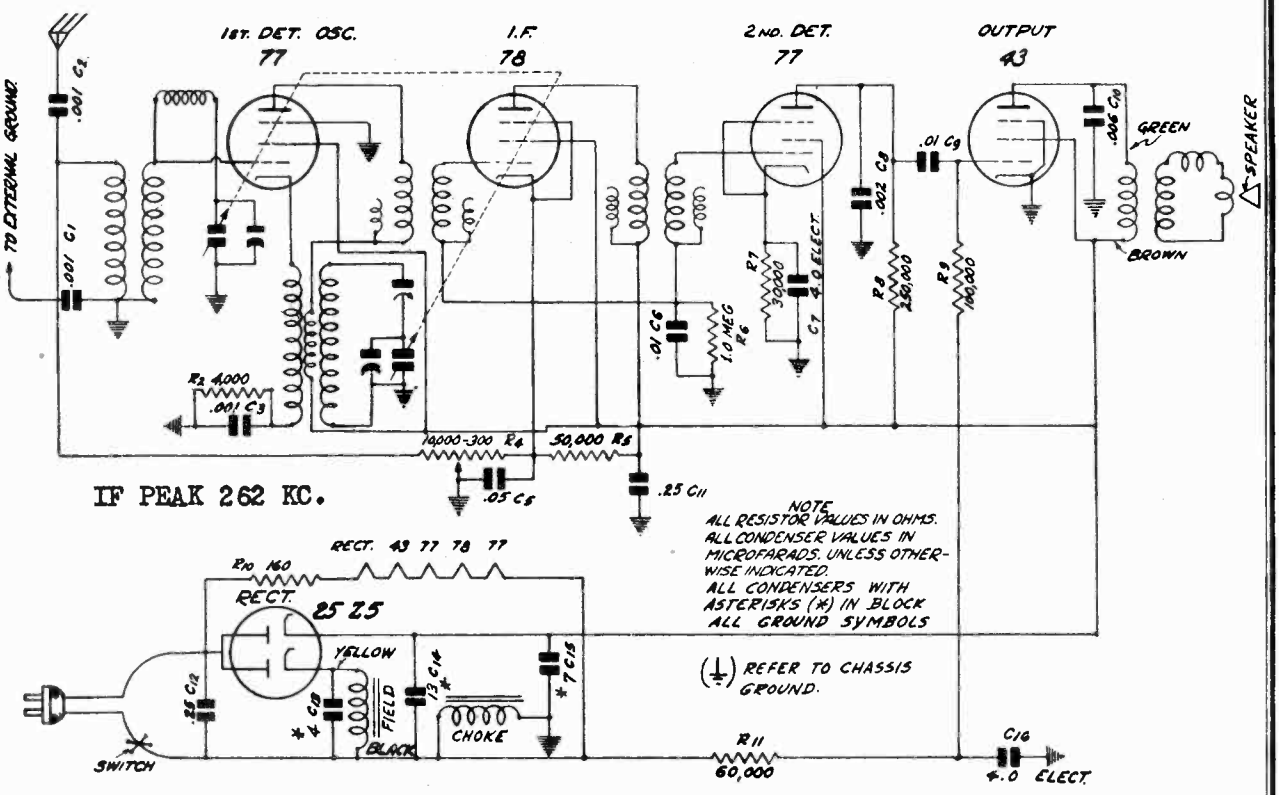
Antenna lead connected to ground lead (not external ground).—Volume Control at Maximum.
CAUTION—Do not put chassis on any grounded surface or let chassis touch any ground.

Type of Tube	Function	A.C. Line Voltage—115 Use High Resistance A.C. Meter, Rectifier Type, for Heater Voltage Measurements: Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.	D.C. Line Voltage—110 Use High Resistance D.C. Meter for Heater Voltage Measurements: Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.
77	1st Det. Osc.	5.8	106	106	5.2	.8	5.6	87	87	4.3	.6
78	I.F.	5.8	108	108	3.0(1)	7.4	5.6	88	88	2.4(1)	6.0
77	2nd Det.	5.8	65(2)	104	6.0(3)	.14	5.6	58(2)	82	5.0(3)	.11
43	Output	24.	95	110	18.0(4)	22.0	23.0	80	90	15.0(4)	17.0
25Z5	Rect.	24.	110 / 155 (5)			84.0 Total	23.0	5.0 / 6.0 (5)			74.0 Total

(1) Cathode to Ground.
(2) With 1,000,000 ohm meter—reading will be lower with lower resistance meter.
(3) Cathode to ground—read with 100,000 ohm meter.
(4) Read across filter choke.
(5) Readings from plate to two cathodes with 250,000 ohm meter

MODEL 62-98
Schematic, Values
Hum notes

MONTGOMERY-WARD & CO.



CONDENSERS

Part No.	Code	Capacity	Voltage	Type
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P-80821-B	C-2	.001 "	600 V.	Moulded
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P-80862-C	C-4	.05 "	200 V.	Tubular
P-80862-C	C-5	.05 "	200 V.	Tubular
P-80872-B	C-6	.01 "	600 V.	Tubular
P-80936-C	C-7	4.0 "	30 V.	Electrolytic
P-80914	C-8	.002 "	600 V.	Tubular
P-80872-B	C-9	.01 "	600 V.	Tubular
P-80898	C-10	.006 "	600 V.	Tubular
P-80888-A	C-11	.25 "	200 V.	Tubular
P-80888-A	C-12	.25 "	200 V.	Tubular
P-80944	C-13	4.0 "	150	Elec. Block
	C-14	13.0 "	150	
	C-15	7.0 "	150	
P-80878-C	C-16	4.0 "	150 V.	Electrolytic
P-1539	600 K.C. Trimmer Cond.			
P-80951	Short-wave antenna Trimmer			
P-80943	2-gang Condenser—Direct Drive (Used on early Sets)			
P-80954	2-gang Condenser—Gear Drive			

RESISTORS

Part No.	Code	Resistance	Type
P-A-90906	R-1	2,000 ohm	Carbon
P-A-90947	R-2	4,000 ohm	Carbon
P-A-90954	R-3	250,000 ohm	Carbon
P-91019C	R-4	300-10,000 ohm	Vol. Contr. & Switch
P-A-90941	R-5	50,000 ohm	Carbon
P-A-90948	R-6	1 Megohm	Carbon
P-A-90956	R-7	30,000 ohm	Carbon
P-A-90954	R-8	250,000 ohm	Carbon
P-A-90912	R-9	100,000 ohm	Carbon
P-91064	R-10	160 ohm	Armored Wire Wound
P-A-91036	R-11	60,000 ohm	Carbon

Part No.	Item
P-5091	Antenna R. F. Transformer Assembly
P-5092	Oscillator Coil Assembly
P-40428	Can Only for Antenna R. F. Transformer
P-40428	Can Only for Oscillator
P-5101	1st I. F. Trans. Complete with can
P-5102	2nd I. F. Trans. Complete with can
P-50584	Filter Choke
P-1777	No. 77 Tube Socket
P-1778	No. 78 Tube Socket
P-1776	No. 43 Tube Socket
P-1779	No. 25Z5 Tube Socket
P-1783	Broadcast Short-wave Switch
P-20632	Tube Shield
P-20631	Tube Shield Base
P-20633	Tube Shield Cap
P-70739	Power Cord and Plug
P-30342	Grid Cap
P-1786	Five-Lug Terminal Strip
P-1773	Electro-Dynamic Speaker
P-1421	Single Lug Terminal Strip

Excessive Hum

Defective tubes especially the 43 and 25Z5 are very often the cause of excessive hum. Try out a complete new set of tubes and note any difference. The hum may be due to external pick-up. Disconnect the antenna and ground and see if the hum disappears.

Open filter condensers will cause excessive hum. Inspect these condensers and the leads to them for continuity of circuit. A shorted filter choke or shorted hum bucking coil in the speaker will cause excessive hum. Other causes of excessive hum are condensers C-12 or C-16 open and open 77 control grid.

The early models of this receiver did not have a 4 Mfd. condenser connected between the 2nd det. cathode and ground as shown in Fig. 1. If the 77 2nd det. tube in these sets has cathode to heater leakage, the set will hum excessively. This can be corrected by connecting a 4 Mfd. electrolytic condenser between the points mentioned above.

MONTGOMERY-WARD & CO.

MODEL 62-98
Voltage, Alignment
Socket layout

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and an output indicating meter are advisable. The procedure is as follows:

As the I.F. stages are self-tuned, no I.F. aligning at the intermediate frequency of 262 K.C. is required.

First set the signal generator for a signal of exactly 1400 K.C. Connect the antenna lead from the signal generator to the antenna lead of the receiver and the ground lead of the signal generator to the ground of the receiver. Then turn the tuning condenser rotor until the marker is at 1400 K.C. on the dial scale. In order to do this, it will be necessary to put the chassis back in the cabinet. Adjust the two trimmers on the tuning condenser for maximum output adjusting the oscillator trimmer first.

Next set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. This adjusting screw will be seen on the back panel of the chassis. A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Polarity of D.C. Supply

IMPORTANT—When operated on D.C., the polarity of the power supply to the receiver must be observed. Use a receptacle from which the plug will not have to be removed after it has once been correctly inserted.

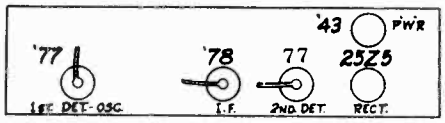
To determine the correct polarity, insert the plug both ways, allowing the tubes time to heat up. With the plug in one way, the receiver will operate and the other way it will not.

CAUTION—Read the Following:

To avoid the danger of damage to the receiver and shock to the person working on the receiver, the following facts should be understood.

The metal chassis is connected to one side of the line through the filter choke—See Fig. 1. Both A.C. and D.C. power supplies are generally grounded on one side. If the side of the line, not connected to the metal chassis, is grounded and the metal chassis comes in contact with the external ground, the entire line voltage will be impressed across the filter choke, resulting in an excessive current. Also, if the service technician working on the set is in contact with any ground, such as the grounded metal top of a bench, and touches the metal chassis when the above condition exists, he will receive a shock.

In any service work, therefore, on the A.C.-D.C. chassis keep it on a wood or other insulated surface. Disconnect the antenna and ground leads to avoid the possibility of any external ground contacts with the chassis. The person working on the set should avoid coming in contact with any ground.



Tube arrangement.

Voltages at Sockets

Antenna lead connected to ground lead (not external ground).—Volume Control at Maximum.
CAUTION—Do not put chassis on any grounded surface or let chassis touch any ground.

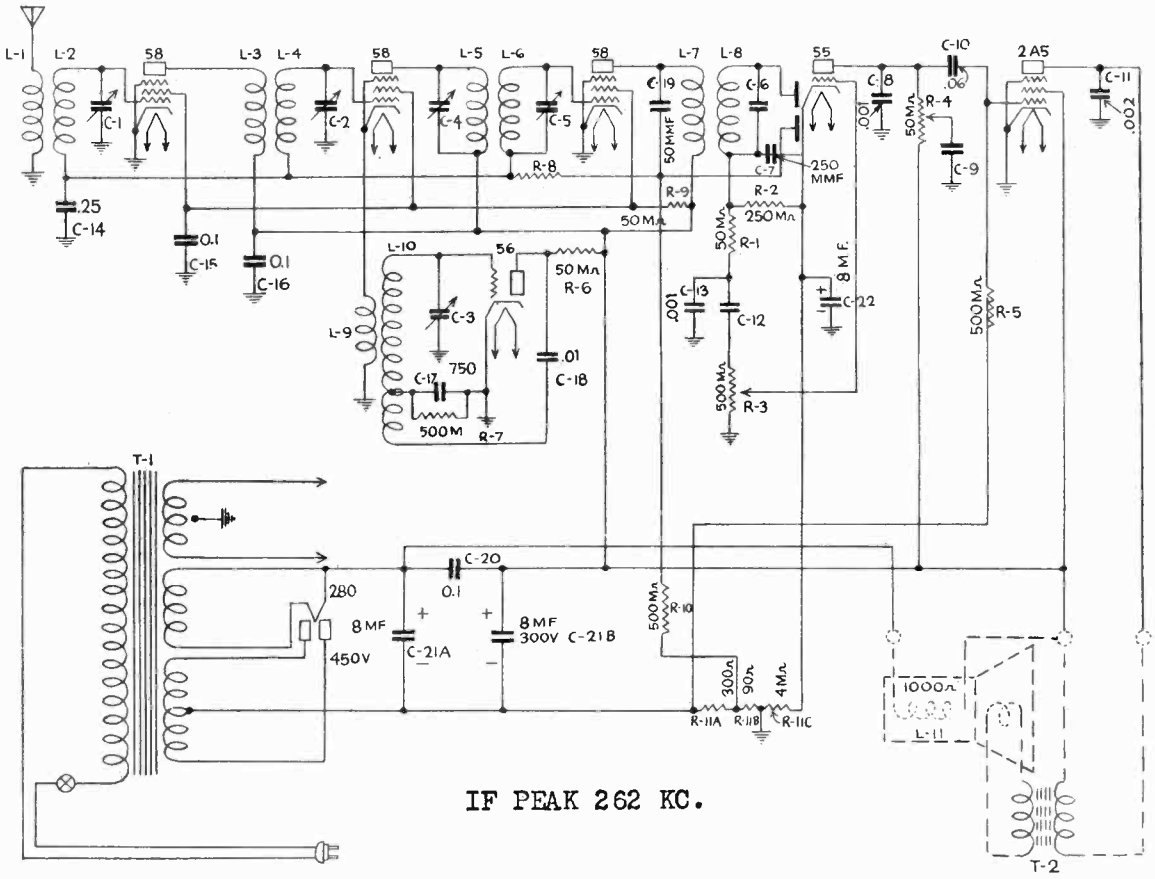
Type of Tube	Function	A.C. Line Voltage—115 (Use High Resistance A.C. Meter, Rectifier Type, for Heater Voltage Measurements) Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.	D.C. Line Voltage—110 (Use High Resistance D.C. Meter for Heater Voltage Measurements) Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.
77	1st Det. Osc.	5.8	106	106	5.2	.8	5.6	87	87	4.3	.6
78	I F.	5.8	108	108	3.0(1)	7.4	5.6	88	88	2.4(1)	6.0
77	2nd Det.	5.8	65(2)	104	6.0(3)	.14	5.6	58(2)	82	5.0(3)	.11
43	Output	24.	95	110	18.0(4)	22.0	23.0	80	90	15.0(4)	17.0
25Z5	Rect.	24.	110 / 155 (5)			84.0 Total	23.0	5.0 / 6.0 (5)			74.0 Total

(1) Cathode to Ground.
(2) With 1,000,000 ohm meter—reading will be lower with lower resistance meter.
(3) Cathode to ground—read with 100,000 ohm meter.
(4) Read across filter choke.
(5) Readings from plate to two cathodes with 250,000 ohm meter

MODEL 62-97, 62-99
62-97X, 62-99X

MONTGOMERY-WARD & CO.

Schematic
Socket layout



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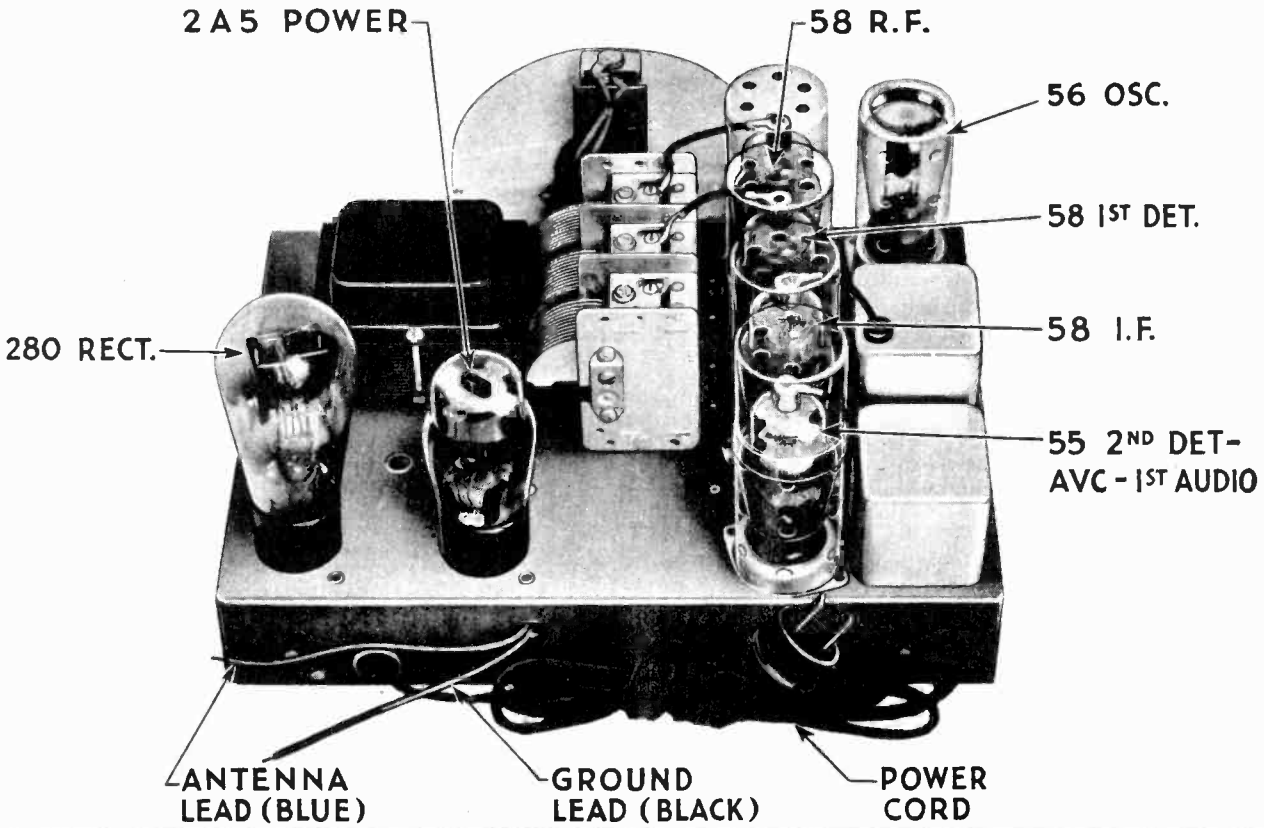


MONTGOMERY-WARD & CO.

MODEL 62-97, 62-99
62-97X, 62-99X
Voltage, Alignment

Alignment

An accurately calibrated signal generator is necessary for the proper alignment of the R. F. and I. F. circuits. This generator must produce an I. F. signal at 262 K. C. as well as R. F. signals throughout the broadcast band of 540 to 1500 K. C. An output meter for determining the maximum output of the receiver is also essential.

The necessity for realignment of the R. F. or I. F. circuits will be indicated by poor sensitivity and selectivity but realignment should not be attempted until all other possible causes for the same condition such as defective tubes, poor antenna installation, shielded location or low line voltage have been checked and eliminated.

Aligning Intermediate Condensers—It is essential that the I. F. stages be correctly tuned for maximum deflection upon the output meter before the R. F. and Oscillator Circuits can be aligned. Connect the signal lead from the signal generator to the control grid contact of the first detector tube. The ground lead from the signal generator is connected to the ground post on the rear of the chassis. Place the signal generator in operation at 262 K. C. and attenuate its output until as low a signal as will give satisfactory deflection on the output meter is obtained. It is important that the signal be maintained at a low value in order to prevent any action of the Automatic Volume Control. *The manual Volume Control should be set at maximum during alignment.*

Then adjust the three Intermediate Condenser screws until maximum output is obtained on the output meter. After all three screws have been adjusted the first time go over them again and check the setting for maximum output. The Intermediate Condenser screws are accessible from beneath the chassis and protrude through the porcelain bases of the I. F. Transformers.

Aligning R. F. and Oscillator Condensers—Place the signal generator in operation at 1400 K. C. and connect the signal lead to the antenna post on the back of the chassis. Turn the Tuning Condenser rotor until the dial pointer is at exactly 1400 on the dial scale. Then adjust the three trimmers on the Tuning Condenser for maximum output, adjusting the Oscillator Trimmer first (Trimmer nearest back of chassis). Turn the screws up or down until greatest deflection on the output meter is obtained. The output of the signal generator should, of course, be attenuated to as low a value as possible consistent with the obtaining of an easily readable deflection on the output meter.

The signal generator should then be adjusted to 600 K. C. and the Tuning Condenser rotor turned until maximum deflection is obtained on the output meter. If the dial pointer does not indicate correct calibration at this setting, the set screws which secure the drive to the Tuning Condenser shaft should be loosened and the pointer shifted to the other side of the 600 mark on the dial by an amount equal to one-half the original variation from the 600 mark. For instance, if the dial reading was 610 when the 600 K. C. signal was tuned in, it should be moved so that the new reading will be 595. Be careful not to move the Tuning Condenser rotor when changing the setting of the dial. After changing the dial setting, tighten the two set screws.

Set the signal generator again for a 1400 K. C. signal and check the adjustment of the Tuning Condenser trimmers at this frequency for maximum output. Then set the signal generator for a signal of 1000 K. C. and turn the Tuning Condenser rotor until the output meter indicates maximum deflection. Then bend the slotted rotor plate sections which are last in mesh, on the R. F. and first detector Tuning Condensers, until maximum output is obtained. Tune in a signal at 750 K. C. and then at 600 K. C. and follow the same procedure, bending the rotor plate sections last in mesh, on the R. F. and first detector Tuning Condensers, until maximum output is indicated. Do not bend the end plates on the oscillator Tuning Condenser.

Testing Condensers

The simplest method of locating an open condenser is to shunt each one in the chassis with another of similar capacity, known to be in good condition, until the defective unit is located.

Open Bypass Condensers will usually be indicated by oscillation or distorted reproduction. Open Filter Condensers will cause excessive hum and in the case of the condenser connected to the filament of the 280 tube, a reduction in all D. C. voltages. An open circuit in the condenser connected across the speaker field will cause an excessive hum.

Voltages at Sockets

Line Voltage 115—Volume Control at Maximum

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Grid Volts	Screen Current MA	Plate Current MA	Cathode Volts
56	1	Osc.	2.3	110	15-30(1)	.....	...	3-3.4(1)	0
58	2	R. F.	2.3	260	2.0(2)	90(3)	1.2	4.8	0
58	3	1st Det.	2.3	260	2.0(2)	90(3)	1.3	5.4	0
58	4	I. F.	2.3	260	2.0(2)	90(3)	1.2	4.6	0
55	5	2nd Det.	2.3	Diode 1-0					
		AVC-1st		Diode 2-3					
		Audio		Triode 135	2.0(5)	.....	...	4.6	12
2A5	6	Power	2.3	255	3.0(6)	260	...	.....	0
80	7	Rectifier	4.8	.....	.....	.....	...	26 Per Plate	.....

(1)Varies with frequency approximately as shown.
(2)Voltage as read with 60,000 ohm meter—across 90 ohm section of R-11—50 volts.
(3)Voltage as read with 600,000 ohm meter.
(4)Not actual voltage due to resistance in circuit—tone voltage—17 volts.
(5)Voltage as read with 60,000 ohm meter—across 4000 ohm section of R-11—12 volts.
(6)Voltage as read with 60,000 ohm meter—across 300 and 90 ohm section of R-11—22 volts.

25 Cycle Chassis

The 25 cycle chassis is similar to the 60 cycle chassis with the exception that it is designed to operate on a power supply of from 105 to 125 volts, 25 cycles. A different Power Transformer is used in the 25 cycle chassis from that used in the 60 cycle chassis, and the .1 Mfd. Condenser connected across the speaker field is omitted. The proper Power Transformer is given in the parts list.

The 25 cycle chassis may be used on a Power Supply of from 105 to 125 volts, 60 cycles, but may produce an excessive hum as the field Tuning Condenser is not incorporated in the chassis. The reverse is not true, however, and under no circumstances should it be attempted to operate the 60 cycle chassis on 25 cycle power.

Voltages

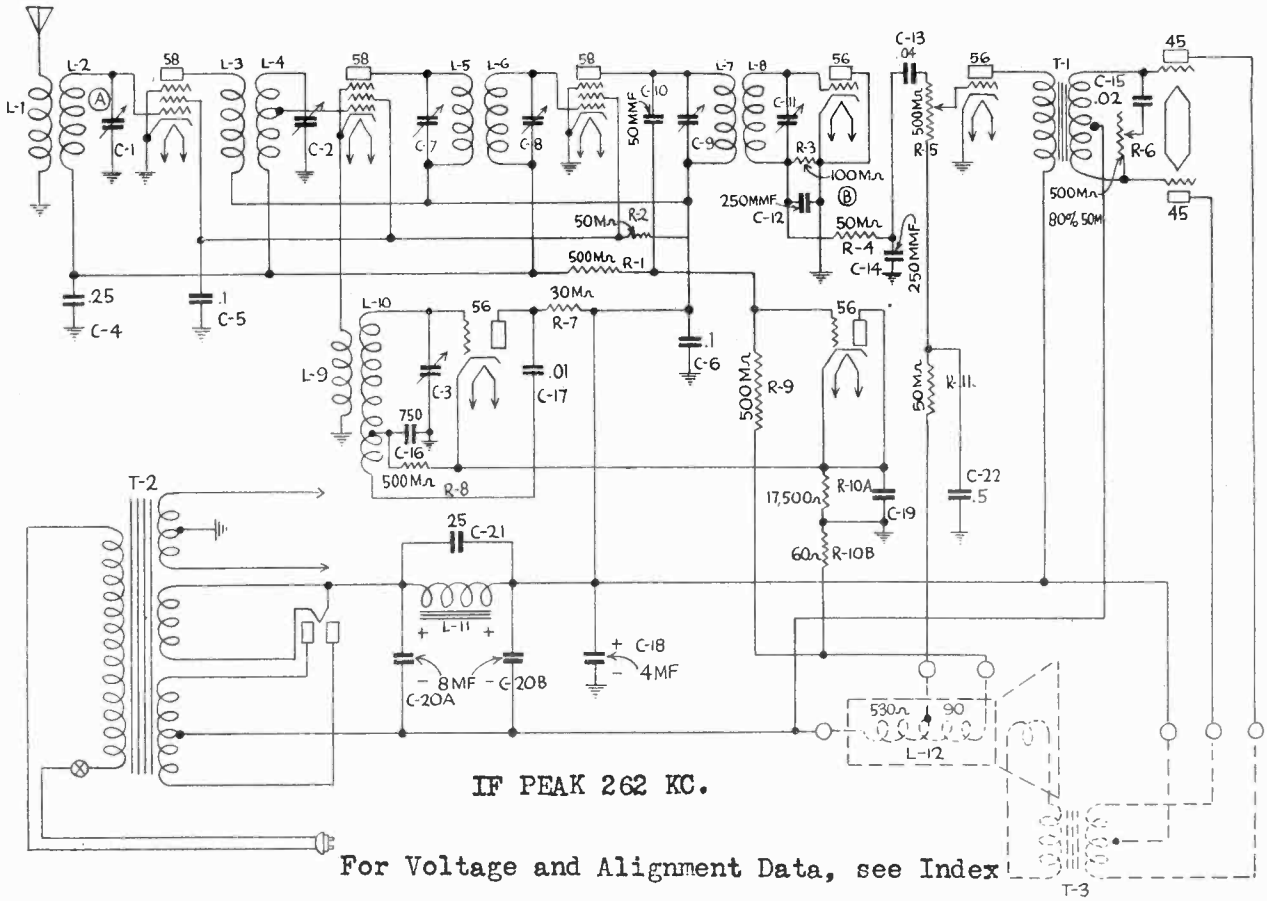
The voltages should be read at the sockets by means of a set analyzer or accurate high resistance meters.

The Voltage Chart shows the voltages and currents with all tubes in, speaker connected and the set otherwise in operating condition. When checking voltages, the set must be correctly installed for operation in all respects. All tube shields with the exception of the one on the socket in which the analyzer plug is inserted should be in position so as to avoid as far as possible any tendency toward oscillation. Oscillation may be brought about by coupling between leads in the analyzer cable and if such is the case it can be overcome by connecting a .1 Mfd. Condenser from the control grid connection on the analyzer plug to the chassis of the receiver.

As indicated in the footnotes some of the voltages cannot be read accurately at the sockets. This is due to voltage drop in certain circuits brought about by the meter current flowing through resistances associated with these circuits. The higher the resistance of the meter used in making such measurements the more accurate the readings will be. In certain cases it is desirable to measure the voltages at the point in the chassis where they originate rather than at the sockets.

MODEL 62-101, 62-101X
Schematic, Socket data

MONTGOMERY-WARD & CO.



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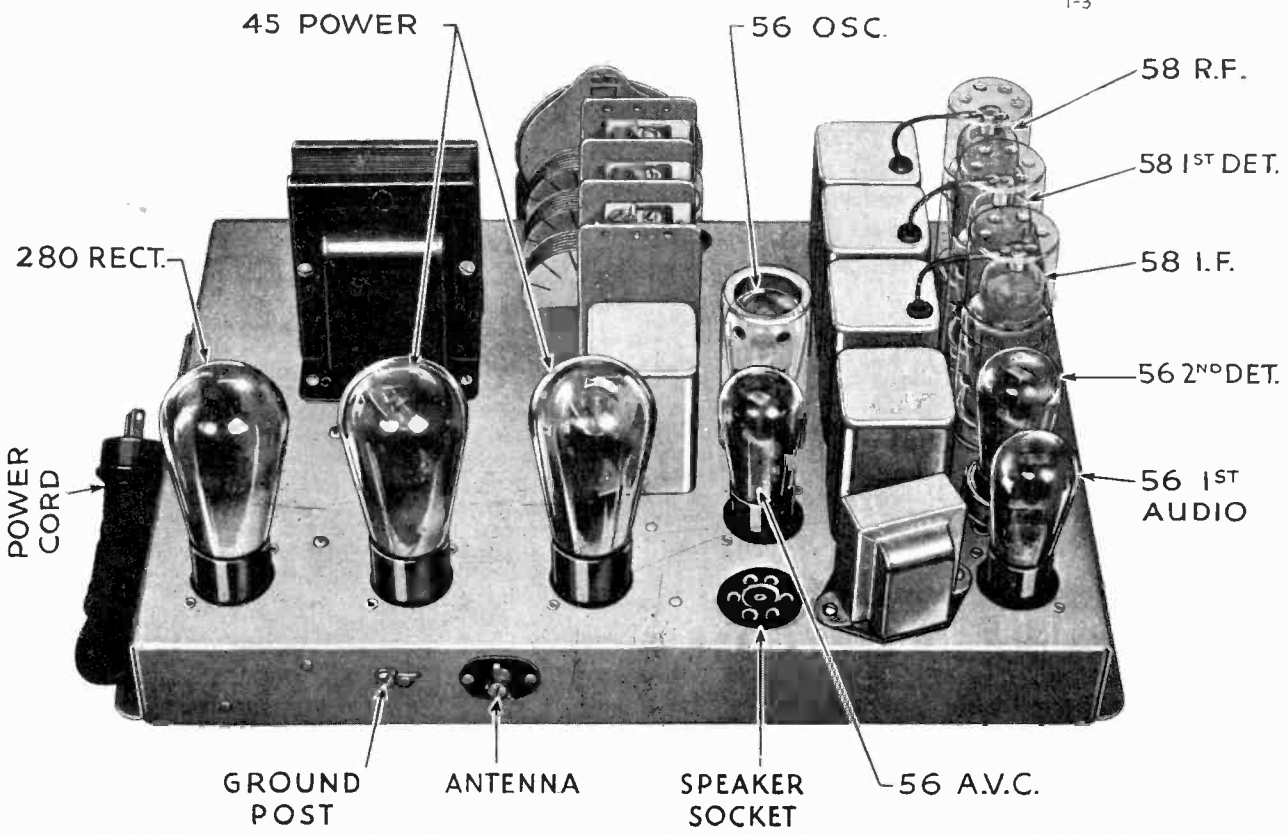
For Voltage and Alignment Data, see Index



MONTGOMERY-WARD & CO.

MODEL 62-91
Voltage, Alignment
MODEL 62-101

MODEL 62-91
Voltages at Sockets

Antenna Shorted to Ground
Batteries Up to Rated Voltages. See Fig. 1
Voltages Read From Negative Filament Terminal

Type of Tube	Function	Across Filament	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.
34	R.F.	2.0	135	65	3.0(1)	2.6
34	1st Det.	2.0	135	65	4.5(1)	2.5
30	Osc.	2.0	90		2–4(2)	3.3
34	I.F.	2.0	135	90	4.5(1)	3.0
30	2nd Det.	2.0				
30	1st Audio	2.0	90		9.0(3)	.45
30	2nd Audio	2.0	130		9.0(4)	3.4
30	Output	2.0	135		10.5	2.5

(1) Computed figure—cannot be read because of high resistance circuit.
(2) Varies with frequency setting.
(3) Volume Control at minimum.
(4) As read at battery.

MODEL 62-91
Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide an accurately calibrated signal of 175 K. C. and accurately calibrated signals over the broadcast band, and an output indicating meter are desirable. The procedure is as follows:

Set the signal generator for 175 K. C. Connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. Then adjust the four intermediate frequency condensers for maximum output. The adjusting screws for these condensers are reached from the bottom of the chassis.

Next set the signal generator for a signal of exactly 1400 K. C. The antenna lead from the signal generator is, in this instance, connected to the antenna lead of the receiver. Set the dial pointer on the 1400 K. C. mark on the dial scale and adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator trimmer first.

The tuning condensers are all adjusted at the factory for the correct relative capacity between the oscillator section and the other two sections. As a rule no adjustment other than at 1400 K. C., as mentioned above, is required. If, after the receiver has been aligned at 1400 K. C., the sensitivity is still low at some portion of the band, adjust the signal generator to that setting and tune for maximum output with the station selector knob on the receiver. Then, without readjusting the trimmers, bend the slotted rotor plates on the **front two sections** of the gang to obtain maximum output. Care should be taken not to bend these plates too far in an inward direction as the condenser may short as a result.

After any adjustment of this nature, set the signal generator again for a signal of 1400 K. C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

VOLTAGE DATA FOR MODEL 62-101

Line Voltage—115—Volume Control at Maximum

Position of Tube	Type of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Grid Volts	Screen Current MA	Plate Current MA	Cathode Volts
1	58	R. F.	2.35	270	1.2(1)	70(2)	1.3	5.0	0
2	58	1st Det.	2.35	270	1.2(1)	70(2)	1.3	6.0	0
3	58	I. F.	2.35	270	1.2(1)	70(2)	1.3	5.6	0
4	56	2nd Det.	2.35	0	0	....	....	0	0
5	56	1st Audio	2.35	250	2.0(3)	....	....	7.2	0
6	56	Osc.	2.35	100	8.0–12.0(4)	....	....	32–3.4(4)	53
7	56	AVC	2.35	0	15.0(5)	....	....	0	53
8	45	Power	2.35	265	57.0	....	....	25.0	....
9	45	Power	2.35	265	57.0	....	....	25.0	....
10	80	Rectifier	4.9	....	....	....	....	43 Per Plate	....

(1)Actual voltage developed across 60 ohm section of R-10—5.0.
(2)Voltage as read with 120,000 ohm meter.
(3)Actual voltage across 90 ohm section of L-12 and 60 ohm section of R-10 and 12.0.
(4)Varies with frequency approximately as shown.
(5)Actual voltage across R-10—58 volts.

ALIGNMENT DATA FOR MODEL 62-101

An accurately calibrated signal generator is necessary for the proper alignment of the R. F. and I. F. circuits. This generator must produce an I. F. signal at 262 K. C. as well as R. F. signals throughout the broadcast band of 540 to 1500 K. C. An output meter for determining the maximum output of the receiver is also essential.

The necessity for realignment of the R. F. or I. F. circuits will usually be indicated by poor sensitivity and selectivity, but realignment should not be attempted until all other possible causes for the same condition, such as defective tubes, poor antenna installation, shielded location or low line voltage have been checked and eliminated as contributing causes.

During the following alignment procedure the 56 AVC Tube should be replaced with a dummy tube (one from which one filament prong has been cut). This will prevent any possibility of AVC action which would make it difficult to determine the exact point of the output peak when adjusting the trimmer condensers. The signal applied to the receiver during alignment should be maintained at as low a value as will give an indication on the output meter sufficient to insure accurate adjustment of the trimmer condensers.

Aligning Intermediate Condensers—It is essential that the I. F. stages be correctly tuned for maximum deflection upon the output meter before the R. F. and oscillator circuits can be aligned.

Remove the 56 oscillator tube and connect the signal lead from the signal generator to the control grid contact of the first detector tube. The ground lead from the signal generator is connected to the ground post on the rear of the chassis. Place the signal generator in operation at 262 K. C. and attenuate its output until as low a signal as will give satisfactory deflection on the output meter is obtained. The manual volume control should be set at maximum during alignment.

Then adjust the four intermediate condenser screws until maximum output is indicated on the output meter. After all four screws have been adjusted the first time go over them again and check the setting for maximum output. The intermediate condenser screws are accessible from beneath the chassis and protrude through the porcelain bases of the I. F. Transformers.

Aligning R. F. and Oscillator Condensers—Replace the 56 oscillator tube and place the signal generator in operation at 1400 K. C. Connect the signal lead to the antenna post on the back of the chassis and turn the tuning condenser rotor until the dial pointer is at exactly 1400 on the dial scale. Then adjust the three trimmers on the tuning condenser for maximum output, adjusting the oscillator trimmer first (trimmer nearest back of chassis). Turn the screws up or down until greatest deflection on the output meter is obtained. The output of the signal generator should, of course, be attenuated to as low a value as is consistent with the obtaining of an easily readable deflection on the output meter.

The signal generator should then be adjusted to 600 K. C. and the tuning condenser rotor turned until maximum deflection is obtained on the output meter. If the dial pointer does not indicate correct calibration at this setting, the set screws which secure the drive to the tuning condenser shaft should be loosened and the pointer shifted to the other side of the 600 mark on the dial by an amount equal to one-half the original variation from the 600 mark. For instance, if the dial reading was 610 when the 600 K. C. signal was tuned in, it should be moved so that the new reading will be 595. Be careful not to move the tuning condenser rotor when changing the setting of the dial. After changing the dial setting, tighten the two set screws.

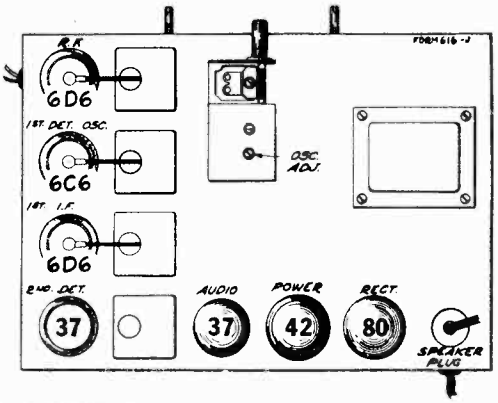
Set the signal generator again for a 1400 K. C. signal and the tuning condenser trimmers for maximum output. Then set the signal generator for a signal of 1000 K. C. and turn the tuning condenser rotor until the output meter indicates maximum deflection. Then bend the slotted rotor plate sections which are last in mesh, on the R. F. and detector tuning condensers, until maximum output is indicated. Tune in signal at 750 K. C. and then at 600 K. C., and follow the same procedure, bending the rotor plate sections last in mesh on the R. F. and 1st detector tuning condensers until maximum output is obtained.

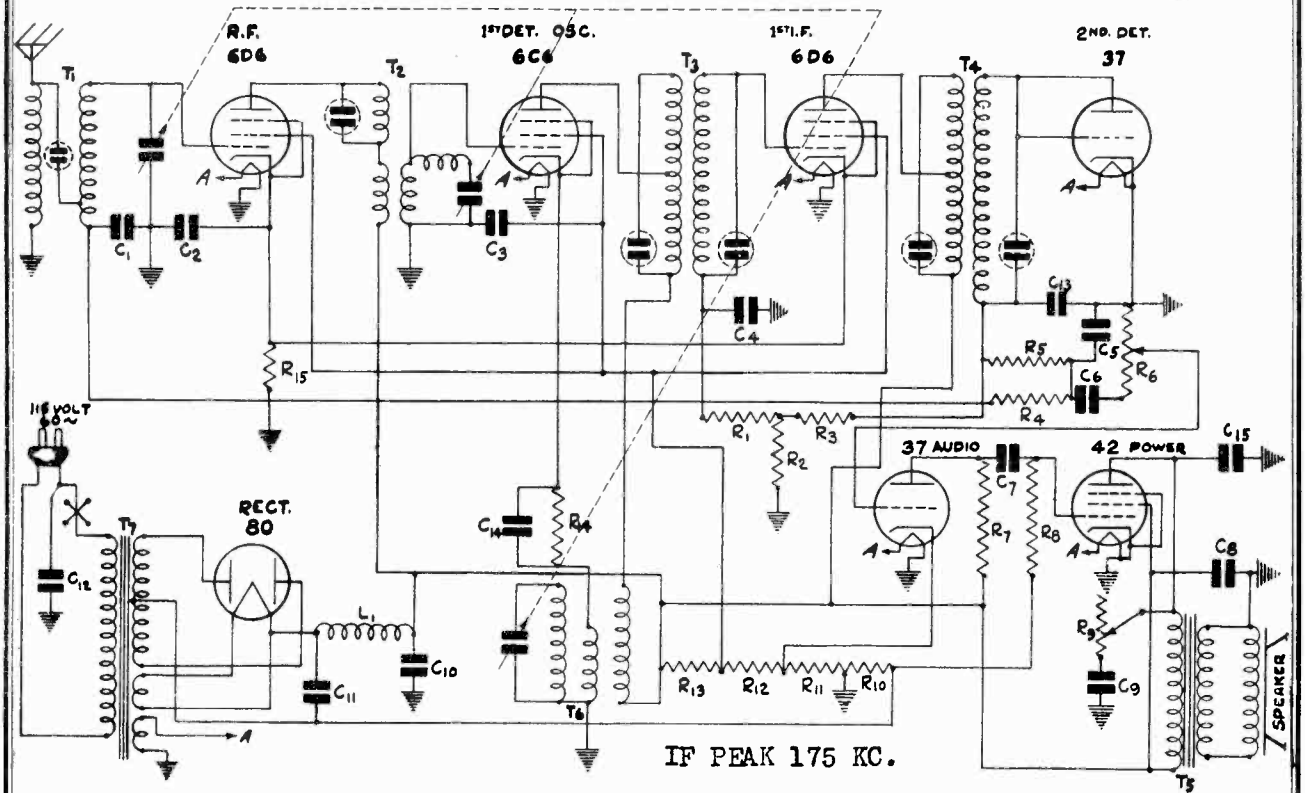
MODEL 62-103, 62-105
Schematic, Values
Socket layout, Changes

MONTGOMERY-WARD & CO.

Changes in Later Models

In later models a condenser has been added which is connected from the First Audio cathode to ground. This condenser is not shown in the circuit diagram, Fig. 1. An 8 mfd. 25 Volt electrolytic condenser is used. The reason for this change is to avoid hum caused by some type 37 tubes used in the first audio stage. All chassis with a yellow paint spot at the back of the subpanel base have this condenser. In case hum is experienced in some of the first models which do not have this condenser, try out some new 37 tubes in the first audio socket. If no relief from this source of hum can be obtained, connect an 8 mfd. condenser as mentioned above, from the first audio cathode to ground.





RESISTORS

Part No.	Code	Resistance	Type
P-A95105	R1	1 megohm	Carbon
P-A95503	R2	50,000 ohm	Carbon
P-A95154	R3	150,000 ohm	Carbon
P-A95205	R4	2 megohm	Carbon
P-A95104	R5	100,000 ohm	Carbon
P- 96004	R6	1 megohm	Vol. Control & Switch
P-A95204	R7	200,000 ohm	Carbon
P-A95204	R8	200,000 ohm	Carbon
P- 97007	R9	150,000 ohm	Tone Control
P-A98002	R10	250 ohm	Arm. Wire Wound
	R11	800 ohm	
	R12	20,000 ohm	
	R13	18,000 ohm	
P-A93452	R14	4,500 ohm	Carbon
P-A94201	R15	200 ohm	Carbon

"A" preceding the number signifies .2 watt.
"B" preceding the number signifies .5 watt.
"C" preceding the number signifies 1.0 watt.

CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-80862	C1	.050 mfd.	200 V.	Tubular
P-80864	C2	.10 mfd.	200 V.	Tubular
P-80888	C3	.25 mfd.	200 V.	Tubular
P-80862	C4	.050 mfd.	200 V.	Tubular
P-80919	C5	250 mmfd.	600 V.	Moulded
P-80862	C6	.050 mfd.	200 V.	Tubular
P-80890	C7	.050 mfd.	400 V.	Tubular
P-80930	C8	.25 mfd.	400 V.	Tubular
P-80890	C9	.050 mfd.	400 V.	Tubular
P-80916	C10	8.0 mfd.	450 V.	Electrolytic
P-80990	C11	16.0 mfd.	450 V.	Electrolytic
P-80997	C12	.010 mfd.	600 V.	Metal can
P-80919	C13	250 mmfd.	600 V.	Moulded
P-80914	C14	.002 mfd.	600 V.	Tubular
P-80914	C15	.002 mfd.	600 V.	Tubular
P-80991	Three Gang Condenser			
P-50603	Power Transformer 60 cycle 110 Volt			
P-50604	Power Transformer 25 cycle 110 Volt			

MONTGOMERY-WARD & CO.

MODEL 62-103, 62-105
Voltage, Alignment

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band, and an output indicating meter are desirable. The procedure is as follows:

As the I. F. stages are fixed tuned, no I. F. alignment at the intermediate frequency of 175 K. C. is required.

First set the signal generator for a signal of exactly 1400 K. C. Connect the antenna lead from the signal generator to the antenna lead of the receiver, and the ground lead from the signal generator to the ground lead of the receiver. Set the dial pointer on the 1400 K. C. mark on the dial scale and adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator trimmer first.

The tuning condensers are all adjusted at the factory for the correct relative capacity between the oscillator section and the other two sections. As a rule no adjustment other than at 1400 K. C., as mentioned above, is required. If, after the receiver has been aligned at 1400 K. C., the sensitivity is still low at some portion of the band, adjust the signal generator to that setting and tune for maximum output with the station selector knob of the receiver. Then, without readjusting the trimmers, bend the slotted rotor plates on the **front two sections** of the gang to obtain maximum output. Care should be taken not to bend these plates too far in an inward direction as the condenser may short as a result.

After any adjustment of this nature, set the signal generator again for a signal of 1400 K. C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Replacing Rubber Drive Pinion

The vernier tuning drive on this chassis uses a rubber pinion. Under normal operating conditions, this rubber will last for a number of years. Should it become worn it can be replaced as follows:

Loosen the set screw of the brass drive bushing and also the retaining screw on the station selector shaft end bearing which is attached to the tuning condenser. Then pull out the station selector shaft. Pull the old rubber pinion off of the brass bushing and put the new one on. The rubber pinion fits tight. Next slip the station selector shaft back in position through the bushing and tighten the two screws.

Excessive Hum

Defective tubes are very often the cause of excessive hum. Try out a complete new set of tubes and note any difference. The hum may be due to external pick-up. Disconnect the antenna and ground and see if the hum disappears.

Hum due to line pick-up can often be reduced by reversing the plug. In severe cases of this nature an external filter in the line may be required.

Open filter condensers can cause excessive hum. Inspect these condensers and the leads to them. Other causes of excessive hum are, unequal rectifier plate currents, defects in grid circuits and defective power transformer.

If Microphonic hum or howl is encountered, switch the tubes of the same type around in the sockets and try out some new ones.

Low Volume

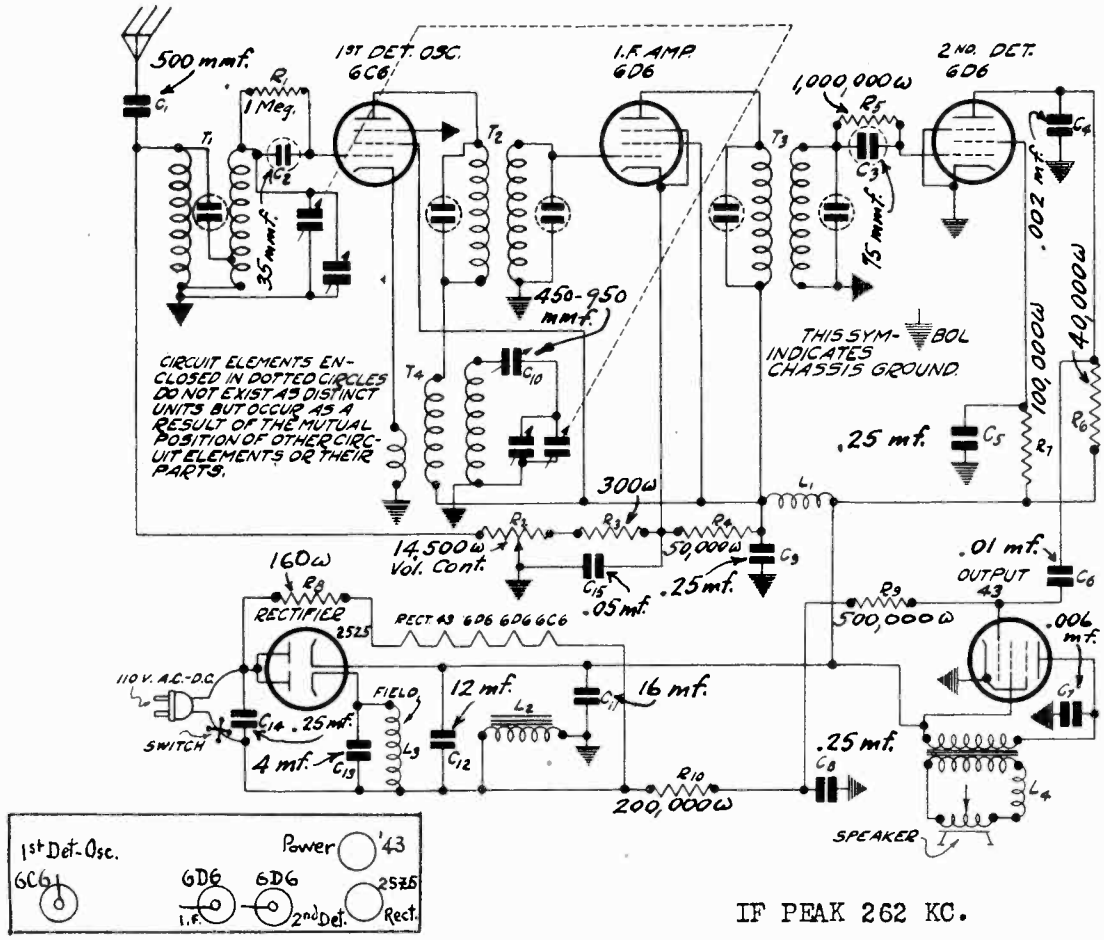
Probably the most common cause of low volume is defective tubes. In any case of low volume, therefore, procure a new set of tubes that have been tested or have been operating satisfactorily in another receiver. Insert these in the chassis one at a time and note any difference in performance.

TYPE	FUNCTION	Fil. Volts	Plate to Cathode	Screen to Cathode	Grid to Cathode	Plate MA
6D6	R.F.	6.2	260	100	3.0*	8.0
6C6	1st Det.	6.2	255	96	12.0	1.0
6D6	I.F.	6.2	260	100	3.0*	8.0
37	2nd Det.	6.2	0	—	0	0
37	A.F.	6.2	60	—	4.6	0.9
42	Output	6.2	246	263	16.0°	33
80	Rect.	5.0	725 V.AC plate to plate			35 per Plate

* Cathode to ground
° As measured across R-10 in voltage divider

MODEL 62-104
Schematic, Voltage
Socket layout

MONTGOMERY-WARD & CO.



IF PEAK 262 KC.

Voltages at Sockets

Antenna lead connected to subpanel.—Volume Control at Maximum.

CAUTION—Do not put chassis on any grounded surface or let chassis touch any ground.

Type of Tube	Function	A.C. Line Voltage—115 Use High Resistance A.C. Meter, Rectifier Type, for Heater Voltage Measurements					D.C. Line Voltage—110 Use High Resistance D.C. Meter for Heater Voltage Measurements				
		Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.	Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate M. A.
6C6	1st Det.	5.8	108	108	12.0(1)	6.0(1)	5.6	90	90	10.0(1)	4.0(1)
6D6	I.F.	5.8	105	105	3.0	7.5	5.6	86	86	2.4	6.0
6D6	2nd Det.	5.8	20(2)	40(2)	.3	2.3	5.6	17(2)	34(2)	.2	2.0
43	Output	24.0	95	108	17.0(3)	20.0	23.0	80	90	14.0(3)	17.0
25Z5	Rect.	24.0	105 / 125 (4)			84.0 Total	23.0	6 / 7 (4)			74.0 Total

(1) Subject to variation.

(2) As read with 1,000,000 ohm meter.

(3) Read across filter choke.

(4) Readings from plate to two cathodes.

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MODEL 62-106, 62-107, 62-121
Schematic, Voltage

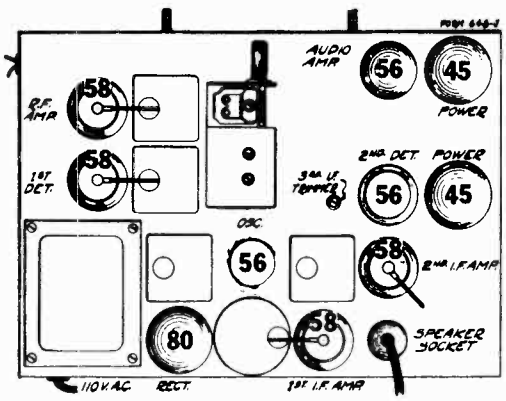


Fig. 2—Tube Arrangement

Twenty-five Cycle Receivers

The twenty-five cycle receiver differs from the sixty-cycle, receiver only in the fact that a different power transformer is used. The correct power transformer is shown in the parts list.

The twenty-five cycle chassis can be operated satisfactorily from a sixty-cycle power supply. However, the reverse is not true, the sixty-cycle receiver cannot be operated from a twenty-five cycle power supply.

A 110-220 Volt, 40-60 cycle Power Transformer is also available for this model.

Voltages at Sockets

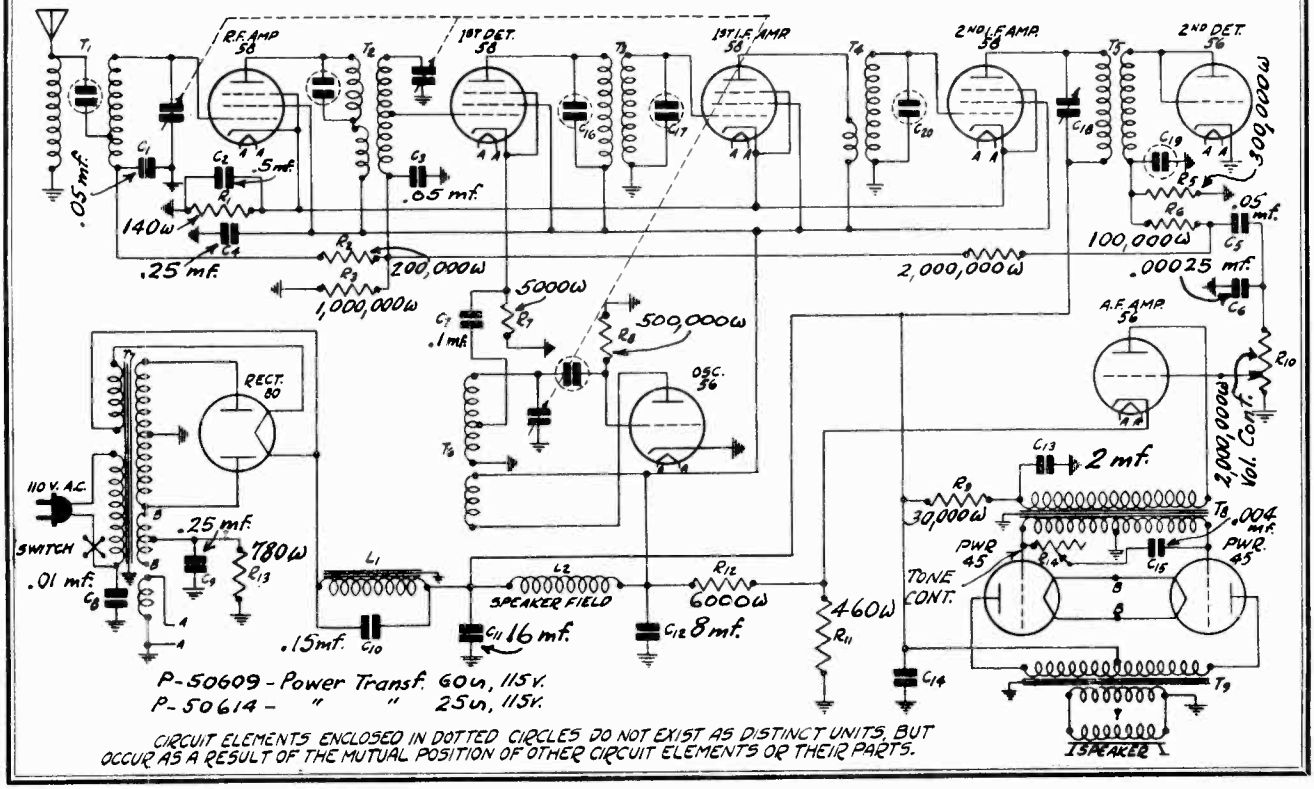
Line Voltage, 115

Antenna Shorted to Ground

Type of Tube	Function	Across Filament or Heater	Plate to Cathode	Screen to Cathode	Control Grid to Cathode	Normal Plate M.A.
58	R.F.	2.3	93	93	3 (1)	6.4
58	1st Det.	2.3	85	85	11 (2)	1.7
56	Osc.	2.3	96		2 (3)	2.8
58	1st I.F.	2.3	93	93	3 (1)	6.4
58	2nd I.F.	2.3	315	93	3	6.6
56	2nd Det.	2.3	0		0	0
56	A.F. Amp.	2.3	170		8 (4)	4.4
45	Power Amp.	2.4	255		50	32.
80	Rectifier	4.7	850 Volts A. C. plate to plate			55 per plate.

(1) Read across R1
(2) Read across R7
(3) Subject to variation
(4) Read across R11

IF PEAK 175 KC.

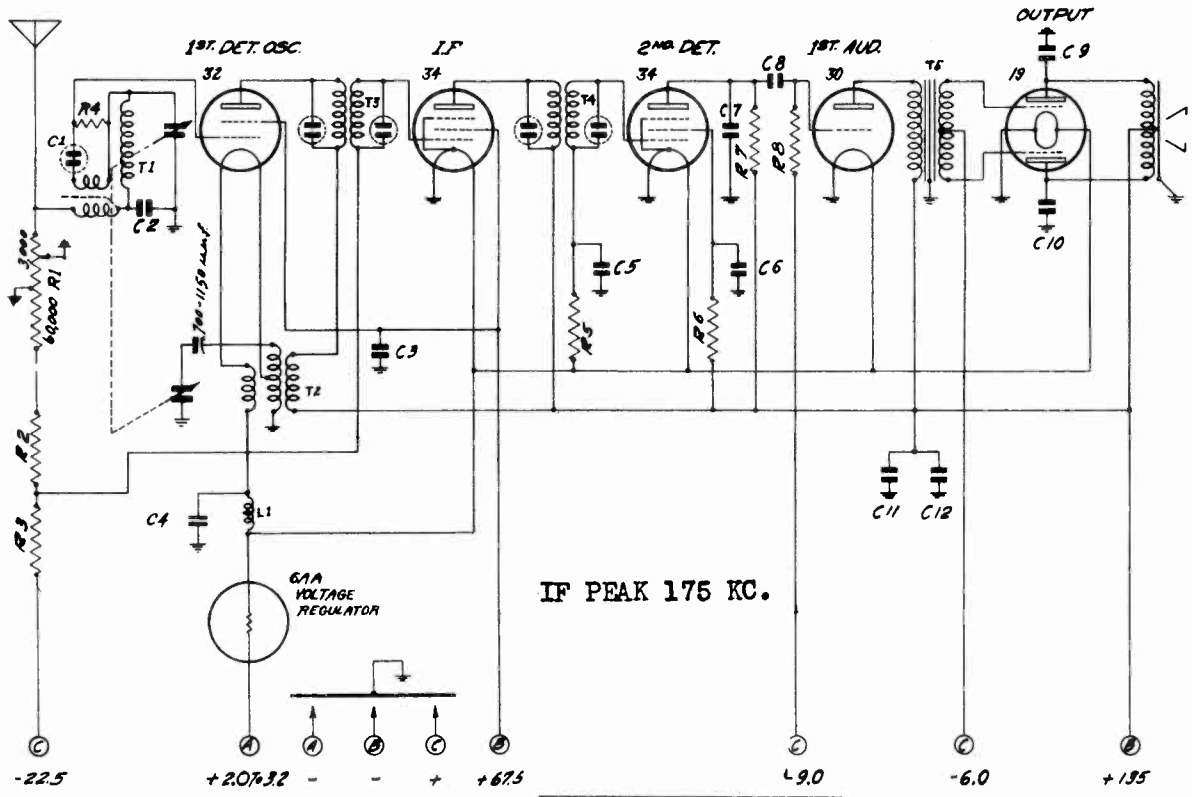


P-50609 - Power Transf. 60∼, 115 V.
P-50614 - " " 25∼, 115 V.

CIRCUIT ELEMENTS ENCLOSED IN DOTTED CIRCLES DO NOT EXIST AS DISTINCT UNITS, BUT OCCUR AS A RESULT OF THE MUTUAL POSITION OF OTHER CIRCUIT ELEMENTS OR THEIR PARTS.

MODEL 77, 95
Schematic, Voltage
Socket layout

MONTGOMERY-WARD & CO.



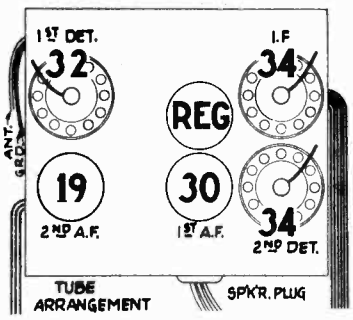
CONDENSERS

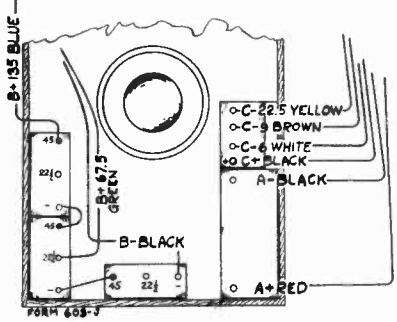
Part No.	Code	Capacity	Voltage	Type
P-80972	C2	.0023 mfd.	400 V.	Tubular
P-80862	C3	.05 mfd.	200 V.	Tubular
P-80888	C4	.25 mfd.	200 V.	Tubular
P-80977	C5	.0001 mfd.	600 V.	Moulded
P-80888	C6	.25 mfd.	200 V.	Tubular
P-80970	C7 .004 mfd. 400 V.; C8 .004 mfd. 400 V.			Dual Tubular
P-80918	C9 .01 mfd. 600 V.; C10 .01 mfd. 600 V.			Dual Tubular
P-80862	C11	.05 mfd.	200 V.	Tubular
P-80968	C12	4.0 mfd.	150 V.	Electrolytic
P-1442	600 K. C. Trimmer Cond.			
P-80983	Gang Condenser			
P-20711	Shield for Two Gang Cond.			

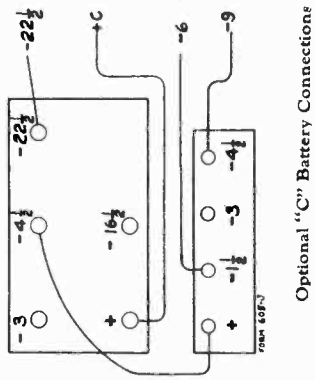
C1 - 40 mmf.

RESISTORS

Part No.	Code	Resistance	Type
P- 96001	R1	63,000 ohm	Volume Control
P-A94901	R2	900 ohm	Carbon Resistor
P-A94652	R3	6,500 ohm	Carbon
P-A94205	R4	2 megohm	Carbon
P-A95105	R5	1 megohm	Carbon
P-A94104	R6	100,000 ohm	Carbon
P-A94403	R7	40,000 ohm	Carbon
P-A95105	R8	1 megohm	Carbon







Optional "C" Battery Connections

TYPE	FUNCTION	Fil. Volts.	Plate to Cathode	Screen to Cathode	Grid to Cathode	Plate MA
32	1st Det-Osc.	2.0	139	70	5	5
34	I.F.	2.2	139	70	2.5	6
34	2nd Det.	2.2	34	40	0	2.5
30	1st A.F.	2.2	135	——	9**	3.0
19	Output	2.2	136	——	6	2.1

* As read at C battery

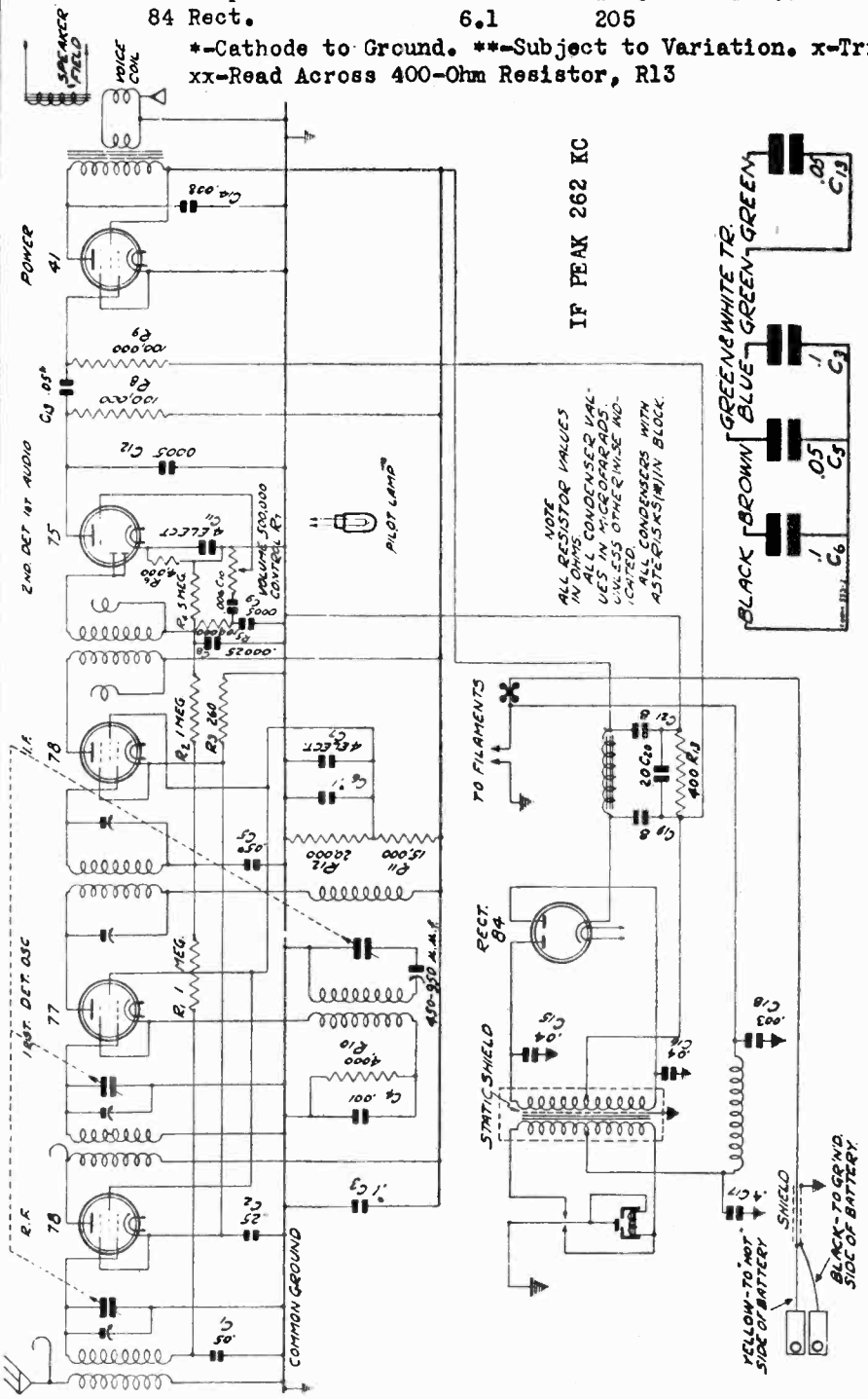
For Alignment Data, see Index

MONTGOMERY-WARD & CO.

MODEL 87
Schematic
Voltage
Socket

	Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate MA
78 R.F.	6.1	182	80	3*	7.0
77 1st Det. & Osc.	6.1	178	77	5**	1.3**
78 I.F.	6.1	182	80	3.*	7.0
75 2nd Det. 1st Audio	6.1	70x		1.4*	.35
41 Output	6.1	172.5	176.5	12.5xx	16.0
84 Rect.	6.1	205			17.5per plate

*-Cathode to Ground. **-Subject to Variation. x-Triode Plate to Cathode
xx-Read Across 400-Ohm Resistor, R13



Condenser Block—Internal Wiring

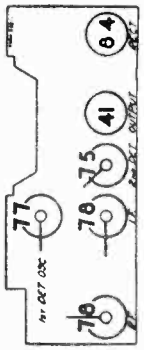


Fig. 8—Location of Tubes

Trying Out the Set and Adjusting

After the wiring has all been completed and before the chassis is permanently installed, try out the set and adjust the antenna trimmer. The location of the tubes is shown in Fig. 8. To adjust the antenna trimmer, tune in a weak signal between 1200 and 1400 K.C. with the volume control about three-fourths on. On one end of the chassis box are two small metal plates. Remove the smaller of these two plates. Directly under the hole in the chassis box is the antenna trimmer condenser screw. Turn this adjusting screw up or down until maximum output is obtained.

MODEL 87
Alignment
Wiring

MONTGOMERY-WARD & CO.

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262 K.C., the intermediate frequency and an output indicating meter are desirable.

First set the signal generator at approximately 262 K.C. Connect the antenna lead from the generator to the control grid of the I.F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A.V.C. action. Note from Fig. 10 that the second I.F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262 K.C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Then adjust the two intermediate frequency condensers for maximum output. One of the I.F. condenser screws is reached through the hole on the top of the 1st I.F. assembly can. The other I.F. condenser screw is reached from the bottom of the sub-panel through a hole at the bottom of this assembly.

Now set the signal generator for a signal of exactly 1400 K.C. The antenna lead from the generator is, in this instance, connected to the antenna lead of the receiver. Connect the flexible drive shaft to the chassis if it has been disconnected. As explained previously, the dial scale should be at the low frequency end stop when the rotor is completely in mesh. Then turn the station selector knob until the dial scale is at 1400 K.C.

Then adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first.

Next, set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The adjusting screw for this condenser is reached through a hole in the back wall of the sub-panel.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Completing the Wiring Connections

Antenna Cable

Bring the antenna cable of the receiver in the most direct manner possible to the lead-in from the antenna and connect it to the latter. Keep it as high as possible and as far away from any car wiring as possible. Care should be taken not to have the antenna wire come in contact with the shield wires. Ground the pigtail of the antenna cable shield at the antenna end. The pigtail of this shield at the chassis end is grounded under one of the chassis mounting screws.

In some cases the shielded antenna lead from the receiver is not long enough to reach to the column at which the antenna lead-in comes down. In a case of this kind, cover the exposed portion of the lead-in wire with loom and braided shield from the point where it leaves the column to the point of connection to the antenna lead of the receiver. Connect the two wires together and connect the two shields together, care being taken that no strand of the shield touches the antenna wire.

Battery Cable

The battery cable should be brought over to the storage battery in the most convenient manner possible. In Figs. 4 and 5 it is shown passing through a hole in the dash, thence down and under the floor board to the battery. In other installations, it may be more convenient to bring this cable down in back of one of the side pads and thence to the battery. The lug on the yellow lead of this cable is connected to the "Hot" or ungrounded side of the battery (the "Hot" or ungrounded side may be positive or negative, depending on the make of car). The lug on the black lead is connected to the grounded side of the battery. The pigtail of the shield of this cable at the chassis end should be grounded under one of the chassis mounting screws.

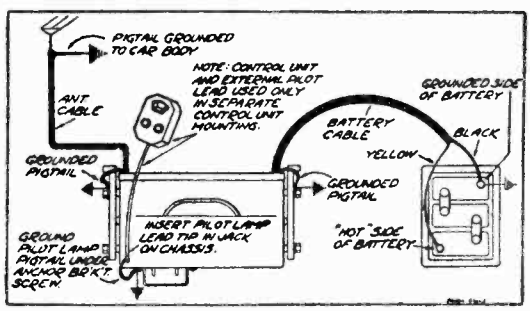


Fig. 7—External Wiring Connections

Pilot Lamp (For Separate Control Unit Only)

When a separate control unit is used connect the pilot lamp as follows:

The pilot lamp lead is in a shielded cable which extends out from the control unit box. On the rear wall of the chassis, near one of the ends, will be seen a tip jack. Insert the tip on the end of the pilot lamp lead into this jack. There is also a pigtail or shield extension at the end of this lead. Ground this pigtail with one of the anchor bracket screws (see Fig. 7). Double up the pilot lamp lead if it is too long—*Do not cut this lead.*

MONTGOMERY-WARD & CO.

MODEL 87
Antenna
Mounting Notes

Antenna

A roof antenna is recommended, as by far the best results will be obtained. A large percentage of cars at the present time come equipped by the factory with built-in roof antennas. In those cars which do not have an antenna, one will have to be put in.

First determine if the top has a grounded chicken wire mesh. To do this, use a continuity meter. By means of a wire, attach a darning needle to one of the prods. Poke the darning needle into the roof material and turn it around until it comes in contact with the chicken wire. Then ground the other prod and if the continuity meter shows a complete circuit, the chicken wire mesh is grounded. In a case of this kind. it will be necessary to get inside of the roof and it is advisable to employ the services of an auto "top man" or an upholsterer.

It will be necessary to remove the top material and cut away the chicken wire from the side supports until it is at least 3" away from ground at any point. It should also be at least 3" away from the dome light and the dome light wiring. The chicken wire may then be laced to the points from which it was cut with a heavy, waxed cord. The chicken wire will then make a satisfactory antenna, or a copper screen may be used.

If the chicken wire is not grounded, it may be used as the antenna by taking down the roof material at one corner and soldering the lead-in wire to it. If it is not desired to take down the roof material a piece of copper screening can be tacked to the roof on the inside of the car. At least six square feet should be used. Keep it at least 3" away from any grounded metal parts on all sides. After the screen is in place, it can be covered over with cloth which matches the roof material. Solder the lead-in wire to the screen and bring it down the front corner post nearest to the set.

Another, and a very simple way in which an antenna can be secured to the inside of the car roof is to use one of the car-roof antennas which are now being made up especially for this purpose. There is one type of antenna which consists of copper strips laid back and forth between two pieces of cardboard. The cardboard is then covered over with material which matches the roof material. This antenna can be had in several colors and is tacked in place on the inside of the car roof in a few minutes.

Integral Mounting of Chassis

By integral or all-in-one mounting of the chassis is meant operating the receiver by means of the controls on the chassis box (and not with a separate control unit). This method is the simplest, as no changes are required on the receiver. It can be installed in several ways, as explained below and as illustrated in Fig. 1. Still other methods of mounting and locations for the chassis will suggest themselves. depending on the space available and variations in the construction of different cars.

Floor or Shelf Mounting

In Fig. 1(A) is shown how the chassis can be placed on the floor in front of the front seat. There are four rubber mounting feet on the bottom of the box. on which it stands. It may also be placed in back of the front seat (B) so as to be in the rear compartment of the car. In some cars, there is room enough between the two front seats for the chassis box to be placed. In coupes, the chassis may be placed on the shelf in back of the seat. Still other locations, as mentioned above, can be used, depending on the space available in different cars.

After the position is decided on, the chassis is permanently mounted in place by means of the two case mounting feet supplied for this method of mounting. These mounting feet are shown in Fig. 1. One side of the foot, which is a small angle bracket, is secured to the end of the chassis box by means of one of the chassis mounting screws. The other side of the foot is screwed to the floor board or surface on which the chassis is resting, with a wood screw. The two feet are placed diagonally, that is on one end of the chassis box it is at the front, while on the other end it is at the rear.

Flush Mounting of Chassis

In Fig. 1(C) is also shown how the chassis can be mounted on the dash by means of brackets, in such a way that the front portion of the box with the controls, is flush, or nearly so, with the instrument panel. This is a very desirable method of installation, as the receiver is rigidly in place, out of the way, and the controls are very accessible.

When mounted this way, two side case brackets (long type) are used, one on each end of the box, as shown in Fig. 1. Two mounting screws are generally used to secure each bracket to the end of the chassis box. Three may be used in cases where the distance between the instrument panel and dash is small. Six embossings with inset nuts are provided on each end of the chassis box. Any two of these or

MODEL 87
Mounting Notes

MONTGOMERY-WARD & CO.

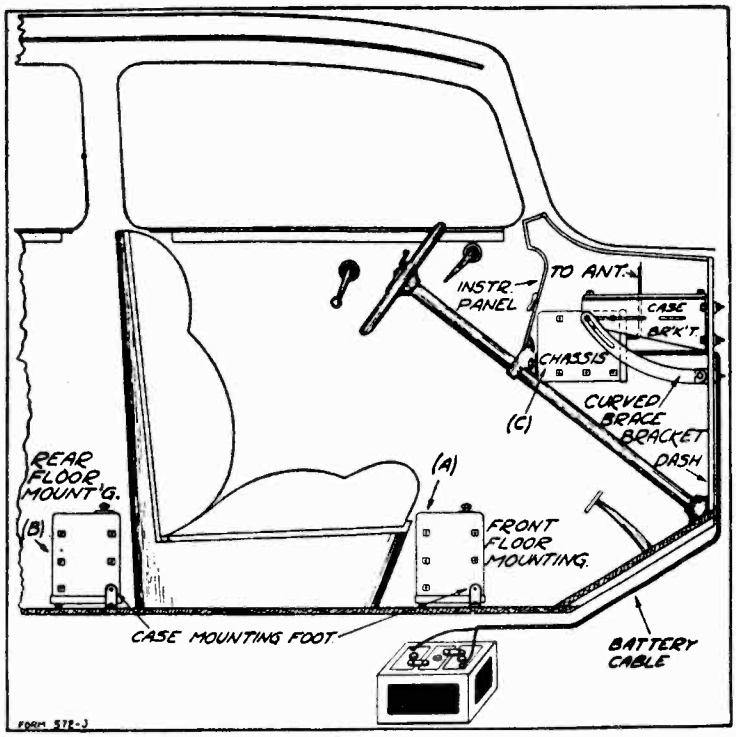


Fig. 1—Integral Mounting—Side View

three, as mentioned above, may be used for the bracket screws, which, together with the slots in the brackets, provides great flexibility in mounting. In addition to the side case brackets, two curved brace brackets and one cross strap brace as shown in Figs. 1 and 2 are used.

The chassis should be mounted as close to the center of the instrument panel as possible. This makes the controls accessible to people in either front seat. As stated above, it should be mounted so that the front side of the box with the controls, is flush or nearly so with the instrument panel of the automobile. If car apparatus or space available prevent the mounting of the chassis at the center, it may have to be moved to either side. In some instances, it can be mounted at the center of the instrument panel, but may have to be moved down and nearer to the dash than as shown in Fig. 1. Consideration should be given to the possibility of interference with the legs of the driver or passenger in the front seat and also to the possibility of interference with the controls of the car, such as pedals, gear shift lever, and hand brake lever, before the location is definitely decided on. The possibility of a car heater installation may also be considered. After the location is decided on, drill the four mounting holes required. The location and size of these holes is shown in Fig. 3. A template for drilling these holes is supplied with the receiver. Six ¼" mounting bolts, six washers, six lockwashers and six nuts are provided. The mounting bolt is put through the bracket and dash with the shank extending into the engine compartment. A washer, the lockwasher and nut, are then put on. Mount the brackets permanently, but do not mount the chassis permanently until the wiring connections are completed, the tubes are all inserted, the receiver tried out, and the antenna trimmer adjusted (explained later).

When the case brackets are in place, the curved brace brackets can be installed. These can be put on in a number of different ways. The front or back case bracket screw can be used and the brace bracket itself can be mounted upward or downward. As a general rule it is mounted on the bracket screw farthest away from the dash and downward as shown in Fig. 1. The small angle brackets supplied with the receiver are secured at the base of the curved brace brackets as shown in Figs. 1 and 2, by means of the No. 10-32 ⅜" Round Head Screw, nut and washer supplied. After the position of the brace brackets is decided on, put them in place and start the holes for them with a center punch. These brackets are bolted to the dash in the same manner as explained above for the case brackets.

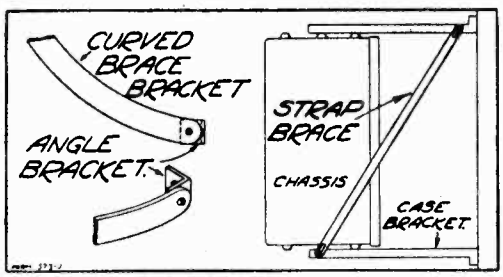


Fig. 2—Angle Brackets and Strap Brace

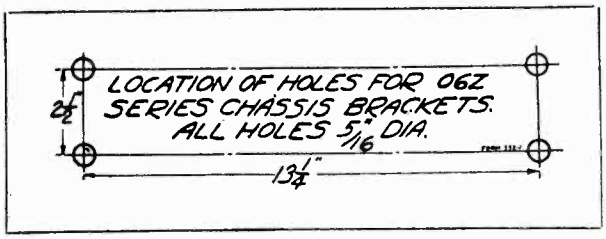


Fig. 3—Mounting Hole Location

Next, put the strap brace in place. This is mounted diagonally across the two brace brackets as shown in Fig. 2. There is a tapped hole at either end of the top flange of the case brackets which are used for this purpose. Two 10-32 ¼" long bolts are provided for the strap brace.

Separate Control Unit Mounting of Chassis

In this method of mounting, the chassis is mounted on the dash and is operated from a separate remote control unit which is on the steering column. Two flexible shafts mechanically connect

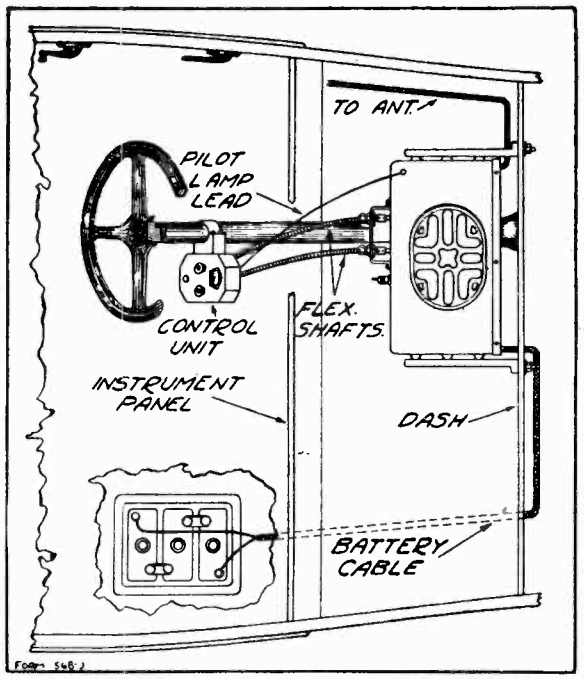


Fig. 4—Chassis with Control Unit—Top View

the control unit and the chassis. This method of mounting is very desirable as the controls are most accessible to the driver. The items required for this method of mounting are shown in the installation list at the back of the manual. The procedure for this method of installation is as follows:

Mounting the Control Unit

The control unit is mounted on the steering column under the steering wheel as shown in Figs. 4 and 5. A clamp is used to hold it in position.

The outer portion of the clamp is screwed to the inner portion by means of the four 8-32x3/8" fillister head screws supplied with the receiver.

Two rubber strips are provided, one 1/8" thick and the other 1/16" thick. These are wrapped around the steering column under the clamp. Either or both of these strips may be used, depending on the thickness of the column. Wrap the rubber strips around the column in such a way as to allow the set screws which hold the clamp in position to pass through. When the clamp is in place, take the two 8-32 headless cup point set screws and screw them down on the steering column through the tapped holes in the clamp.

The control unit is generally about 4" below the wheel, but this will vary with individual cases. The length of the drive shaft and interference with driver's legs will also govern the location of the control unit.

There are two screws which hold the inside portion of the clamp to the control unit swivel. By

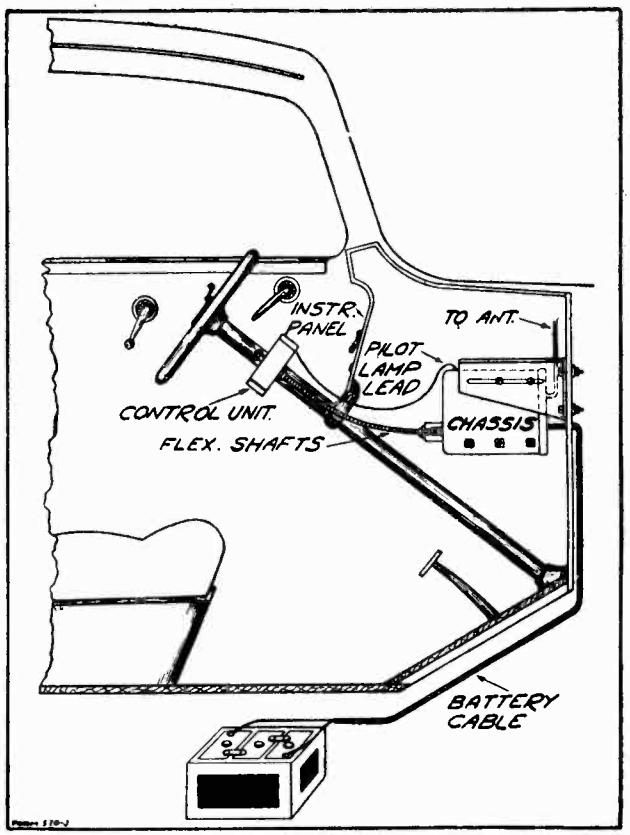


Fig. 5—Chassis with Control Unit—Side View

loosening these two screws, the box can be swung around if such a position is handier from the standpoint of the person operating the set. Instructions for attaching the pilot lamp lead are contained in the article "Completing the Wiring Connections."

Mounting the Chassis

The chassis is mounted on the dash by means of two short brackets, as shown in Figs. 4 and 5. Two or three mounting screws are used to secure each bracket to the end of the chassis box. Three are used if the chassis is close to the dash and two if it is set out some distance. In general, keep the chassis as close to the dash as possible. The procedure for attaching the brackets to the chassis box and to the dash is the same as explained above for mounting the side case brackets under the article, "Flush Mounting of Chassis." No curved brace brackets or strap braces are used in this method of mounting.

The chassis should be mounted with the speaker grill facing down and the side with lock and controls facing the listener, as shown in Fig. 4. Before mounting the chassis, the flexible drive shaft con-

MODEL 87
Flexible Drive

MONTGOMERY-WARD & CO.

nections as explained in the next article must be made.

The location of the chassis will very often depend on the space available. To the left of the center, as shown in Fig. 4, is a good location. The chassis should be mounted in such a way that the flexible drive shafts to the control unit will be in as straight a line as possible or with large radius bends. *In general, it will be advisable to consider the possibility of a car heater installation at the right side of the dash (facing forward).* In practically every case no difficulty will be experienced in mounting the heater and chassis on the dash. The chassis should be mounted in such a way that the lock *which remains on the chassis box will be accessible.*

The possibility of interference with people in the front seats and with car controls, as mentioned previously, should also be considered.

When the location is decided on, drill the four mounting holes required as shown in Fig. 3 and proceed as explained above. Mount the brackets permanently, but do not mount the chassis permanently until the wiring connections are completed, all tubes are in the sockets, the flexible drive shafts connected, and the antenna trimmer adjusted (explained later).

Attaching the Flexible Drive Shafts

After the control unit is mounted and the chassis is temporarily mounted, the flexible drive shafts may be attached. Two 34" shafts are supplied unless otherwise specified. These shafts may also be had in 14", 20" and 45" lengths.

The flexible drive shafts should always be installed with a minimum amount of bending. Always keep the radius of the bend as large as possible. The larger the radius of the bend, the easier the shaft will turn.

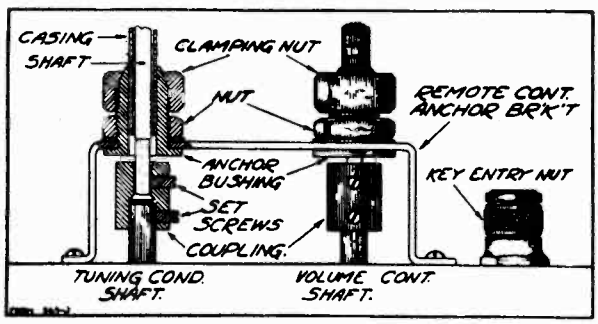


Fig. 6—Details of Flexible Drive Shaft Connections

The 34" shafts supplied with the receiver may be cut to a shorter length if necessary. The shaft (inside portion) should first be brazed at the point to be cut. It should then be cut with a three-corner file or edge of a grinding wheel. *Do not use a hack saw.* After the shaft is cut, file it down in one place a slight amount to provide a flat surface for the set screw. The casing which is 1½" shorter must be cut to correspond. This should be tinned or brazed first at the point to be cut and may then be cut with a hack saw.

It is advisable to attach the flexible shafts with the chassis on the mounting brackets, but if the chassis is inaccessible, it may be removed from the brackets. Keep it as close to its regular position as possible so that the flexible shaft will not turn after the chassis is replaced on the brackets. In general, it may be moved up or down, but should not be moved sideways or be turned.

To attach the flexible shafts to the chassis, first turn the on-off switch knob to the off position and the station selector knob to the low frequency end stop. Then remove the two knobs. These two knobs are then put on the control unit. Loosen the set screws on the two couplings and slip them over the two shafts as shown in Fig. 6. Then secure the remote control anchor bracket in place on the chassis box by means of the four 6-32-¼" screws. The dial gear and pilot lamp remain in the chassis box.

Next, center the two anchor bushings on the anchor bracket. To do this, first loosen the nut which holds the bushing in place. Center the bushing so that the center of it is in line with the center of the shaft below. Then tighten the nut. Turn the on-off switch and volume control knob on the control unit to the extreme counter-clockwise position. Then extend the volume control flexible shaft into the coupling and tighten the two set screws in this coupling. The outside set screw should be tightened down *on one of the four flat faces* of the shaft. Then tighten down the clamping nut on the volume control shaft casing, *but do not tighten this nut excessively.*

To attach the tuning condenser flexible shaft, proceed in the same manner as above, except that the dial gear in the control unit should first be turned to the low frequency end stop. After the two shafts are connected, mount the chassis in place temporarily if it has been taken off and check the operation of both tuning condenser and volume control. The switch should be off when the volume control knob is in the locked position. It may be necessary to loosen the inner set screw and do a slight amount of adjusting until the proper setting is obtained. In case the dial gear in the control unit is not correctly calibrated or does not coincide with the dial gear calibration in the chassis box, further adjustment of this control can be brought about in the same manner, that is, by first loosening the inner set screw of the coupling. The clamping nut of the tuning condenser shaft anchor bushing is tightened down as explained above.

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MODEL 87
Parts List

Replacement Parts for Series Z6Z1 Receivers

CHASSIS PARTS

Part No.	Description
P-1780	No. 75 Tube Socket
P-1761	No. 77 Tube Socket
P-1762	No. 78 Tube Socket
P-1665	No. 41 Tube Socket
P-1803	No. 84 Tube Socket
P-1805	Single Pin Jack
P-1799	Tube Shield Assembly
P-20656	Chassis Box
P-20657	Chassis Box Cover
P-70740	Shielded Antenna Lead
P-70744	Shielded "A" Battery Lead
P-1804	Vibrator Unit (in cast metal case)
P-10266	Vibrator Unit Rubber Cushion, pair
P-20660	Vibrator Unit Box
P-20661	Vibrator Unit Box Cover
P-1572	Fuse Clip Assembly
P-10260	Cardboard Baffle
P-1624	10 Amp. Fuse
P-1774	Electrodynamic Speaker
P-20585	Cond. Drive Gear
P-1801	Volume Control and Drive Bracket
P-20635	Cond. Drive Pinion
P-20677	Pinion Adjustment Plate
P-20614	Lock Lever
P-20658	Tension Spring
P-30419	Entry Plate Assembly
P-1830	Dial Gear and Strip Assembly
P-1816	Celluloid Dial Strip only
P-1810	Pilot Lamp Socket and Spring Clip
P-1563	6-8 Volt Pilot Lamp
P-10263	Rubber Tube Bumper—Square
P-10210	Rubber Tube Bumper—Round
P-10213	Rubber Band for Tube
P-50569	Filter Choke Assembly
P-50585	Power Trans. Assembly—Less condensers and brackets
P-5099	Antenna R. F. Transformer—Less Can
P-5065	Interstage R. F. Transformer—Less Can
P-5105	Second I. F. Transformer and Can Assembly
P-5096	First I. F. and Oscillator Transformer and Can Assembly
P-5097	Single Solenoid "A" Choke
P-40431	Antenna R. F. Can
P-1826	Interstage R. F. Can

Resistors

Part No.	Code No.	Resistance	Type
P-A95105	R-1	1 Megohm	Carbon
P-A95105	R-2	1 Megohm	Carbon
P-B94261	R-3	260 ohm	Carbon
P-A95504	R-4	.5 Megohm	Carbon
P-A95104	R-5	100,000 ohm	Carbon
P-A94402	R-6	4,000 ohm	Carbon
P-91066	R-7	0-500,00 ohm	Volume Control and Switch
P-A95104	R-8	100,000 ohm	Carbon
P-A95104	R-9	100,000 ohm	Carbon
P-A94402	R-10	4,000 ohm	Carbon
P-B94153	R-11	15,000 ohm	Carbon
P-B94203	R-12	20,000 ohm	Carbon
P-C94401	R-13	400 ohm	Carbon

Condensers

Part No.	Code No.	Capacity	Voltage	Type
P-80862	C-1	.05 mfd.	200 V.	Tubular
P-80888	C-2	.25 mfd.	200 V.	Tubular
P-80821-B	C-4	.001 mfd.	600 V.	Molded
P-80937	C-7	4.0 mfd.		Electrolytic Block in can
	C-11	4.0 mfd.		
P-80919	C-8	.00025 mfd.	600 V.	Molded
P-80945	C-9	.0005 mfd.	600 V.	Molded
P-80898	C-10	.006 mfd.	600 V.	Tubular
P-80945	C-12	.0005 mfd.	600 V.	Molded
P-80966	C-14	.008 mfd.	600 V.	Tubular
P-80963	C-15	.04 mfd.	400 V.	Dual Tubular
	C-16	.04 mfd.	400 V.	
P-80960	C-17	.4 mfd.	15 V.	In Metal Can
P-80959	C-18	.003 mfd.	600 V.	Molded
P-80956	C-19	8.0 mfd.	225 V.	Electrolytic Block in Can
	C-20	20.0 mfd.	25 V.	
	C-21	8.0 mfd.	225 V.	
P-80955	C-3	.1 mfd.	300 V.	Bypass Block in Can
	C-5	.05 mfd.	200 V.	
	C-6	.1 mfd.	200 V.	
	C-13	.05 mfd.	300 V.	
P-1539	600 K. C. Trimmer Condenser			
P-80957	Three-Gang Variable Condenser			

CONTROL UNIT PARTS

(When Separate Control Unit Is Used)

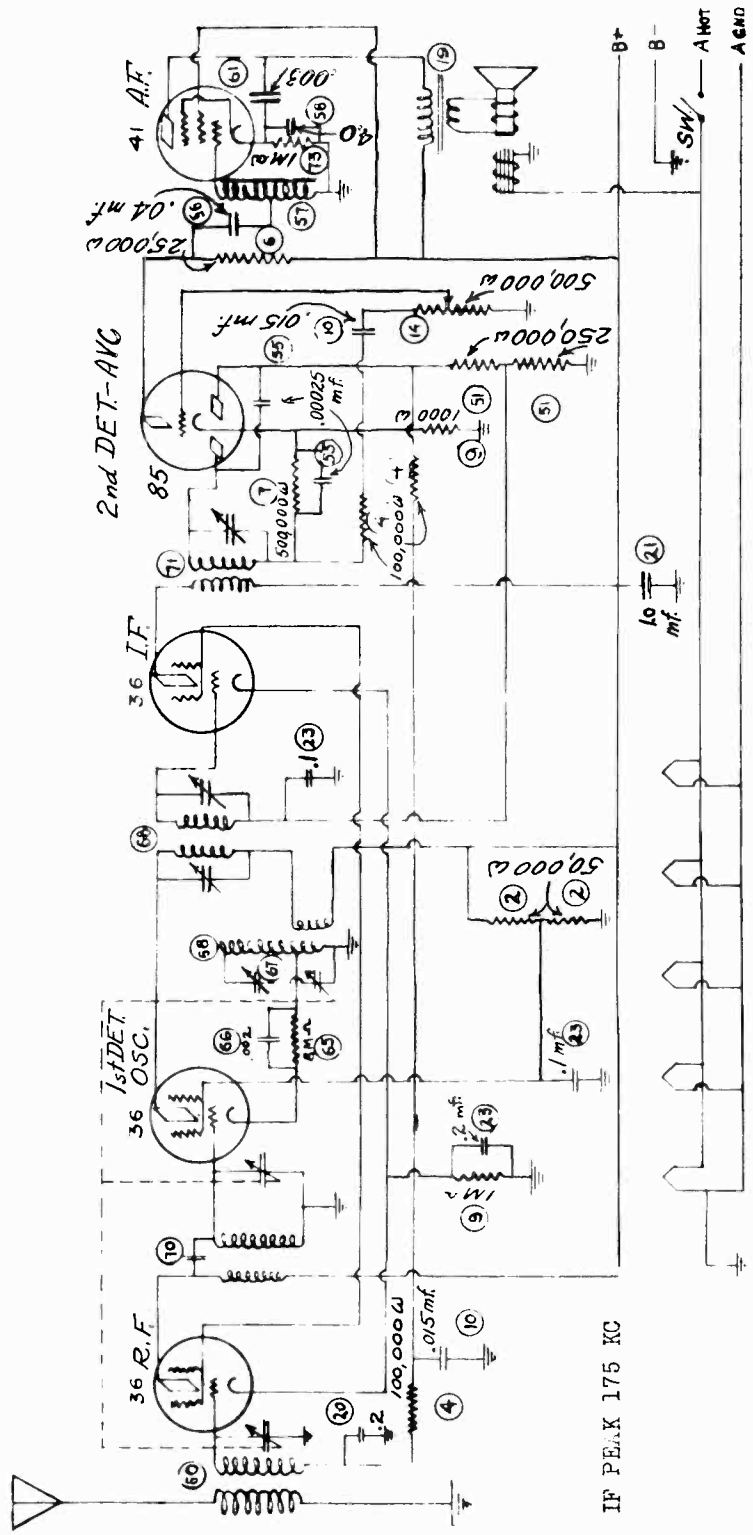
Part No.	Description
P-1816	Celluloid Dial Strip
P-1825	Dial Gear and Strip Assembly
P-20509B	Control Unit Swivel
P-20510A	Steering Post Apron
P-20511	Steering Post Clamp
P-20693	Control Box Cover
P-20635	Cond. Drive Pinion
P-70746	Pilot Lamp Cable only
P-1415A	Pilot Lamp Socket and Clip
P-1563A	6-8 Volt Pilot Lamp
P-30426	Ornamental Plug
P-30414	Key

ITEMS WHICH MAY BE REQUIRED IN SOME CASES

1 — 1550	14" Flexible Drive Shaft—For Control Unit Mounting
1 — 1553	20" Flexible Drive Shaft—For Control Unit Mounting
1 — 1551	34" Flexible Drive Shaft—For Control Unit Mounting
1 — 1552	45" Flexible Drive Shaft—For Control Unit Mounting
1 — 91011	Spark Plug Suppressor—All methods of mounting
1 — 91012	Distributor Suppressor, Wood Screw Ends—All methods of mounting

MOTO-METER GAUGE & EQUIPMENT CO.

MODEL Moto-Vox 10-A
Above # 500
Schematic



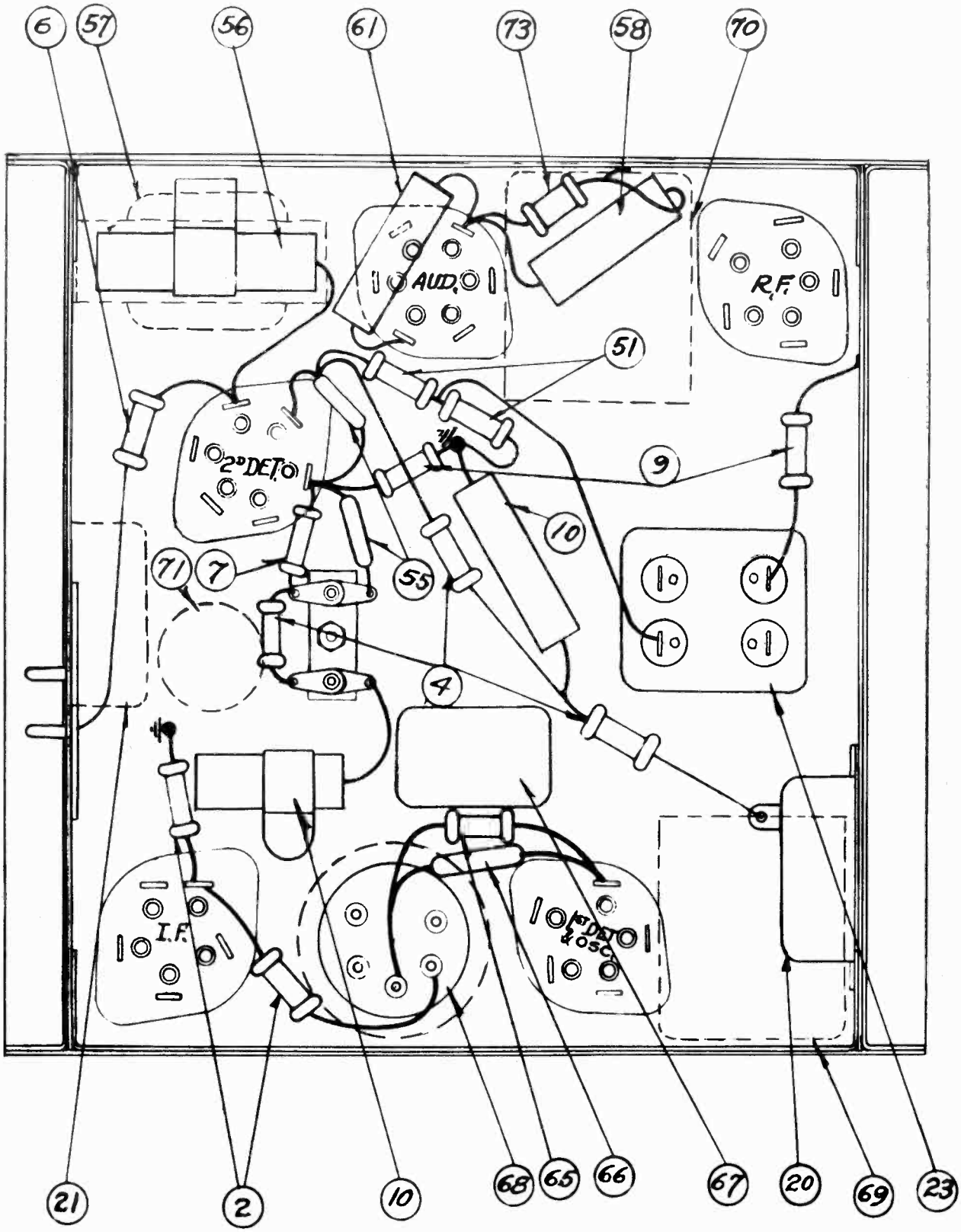
TUBE			CATHODE TO GROUND	CATHODE TO SCREEN	CATHODE TO PLATE
TYPE	PURPOSE	FILAMENT			
36	R.F.	5.6	3.5	82.0	136.0
36	1st Det. & Osc.	5.6	7.0	79.0	193.0
36	I.F.	5.6	3.5	82.0	193.0
85	2nd Det. & A.V.C.	5.6	4.2	——	82.0
41	A.F.	5.6	16.3	182.0	172.0

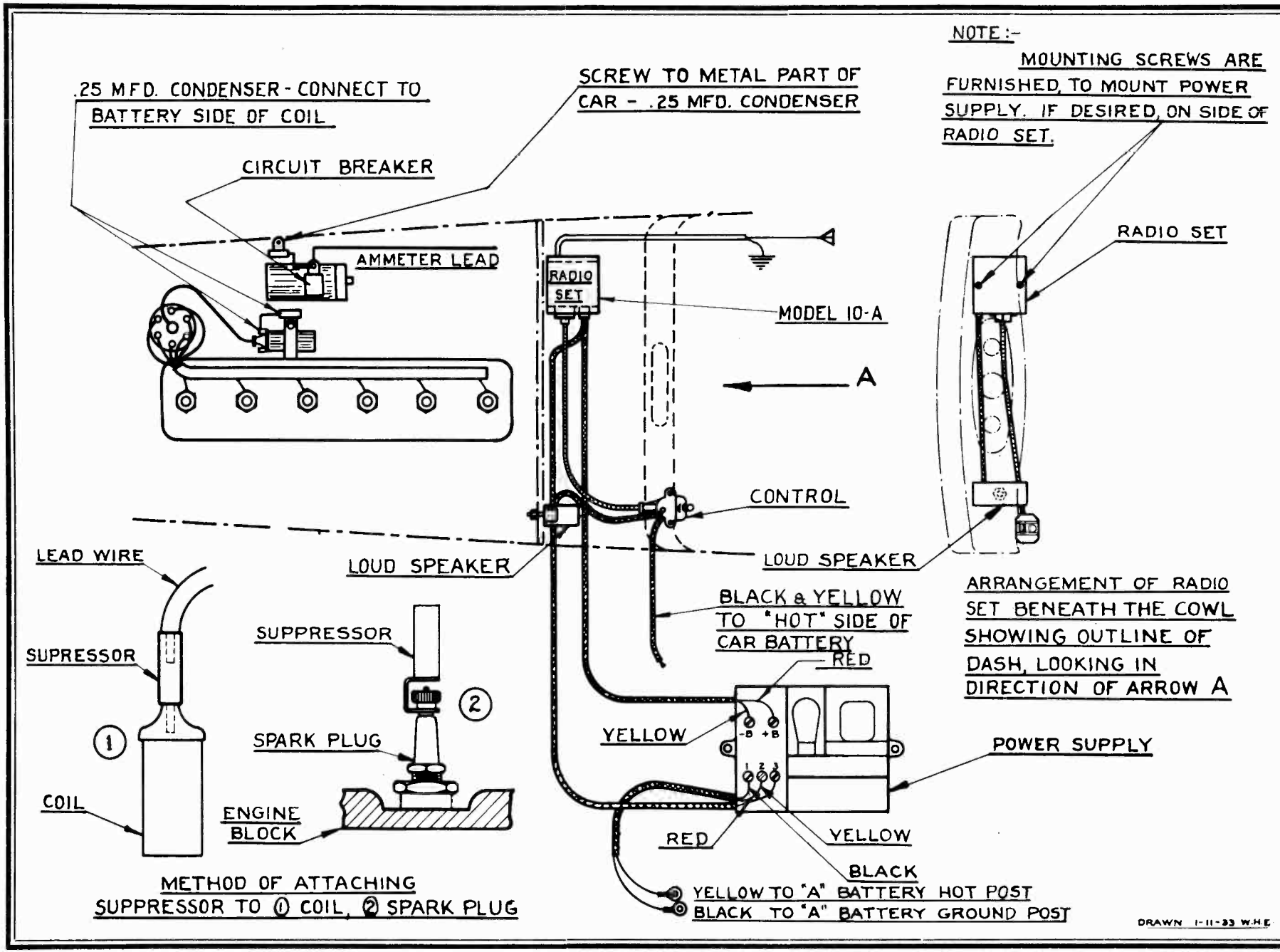
Take readings at tube sockets, when receiver is tuned off signal.

Total drain with input of 5.7 volts. 28 mils at 200 volts.

MODEL 10-A
Moto-Vox
Chassis Wiring
Above Serial 500

MOTO-METER GAUGE & EQUIPMENT CO.





MOTO-METER GAUGE & EQUIPMENT CO.
MODEL Moto-Vox 10-A
Assembly wiring

MODEL Moto-Vox 10-A
10-E MOTO-METER GAUGE & EQUIPMENT CO.

General notes

SPECIAL INSTRUCTIONS - MODEL "10 A" ALL ELECTRIC ONLY

POWER SUPPLY

Provision has been made for mounting the power supply on the bottom of the receiver by means of two self-tapping 1/4" screws, which are assembled in the bottom.

The power supply may also be mounted beneath or behind either front or rear seat.

Mount the power supply. Run the separately shielded Red lead, assembled in the speaker, to the terminal #3.

Assemble the Red lead in the radio cable to the B-plus terminal in the supply and the Yellow lead to the B-minus terminal, making certain that the shield of the cable is anchored by the mounting clamp provided in the power supply. If the cable is too long, do not cut it off, but double it up neatly and place out of sight. Make certain that the shielding on the cable is grounded to the metal part of the car in several places.

Now connect the Black with Yellow tracer lead of the tuning control along with the Yellow lead from the power supply terminal #2 to the Ungrounded post of the battery. Assemble the Black lead from terminal #1 of power supply to the grounded battery post.

IMPORTANT: MAKE CERTAIN THAT THESE CONNECTIONS TO THE BATTERY ARE CORRECT.

The receiver is now ready to be connected up. Plug the cable assembly into the receiver. MAKE SURE THAT THE PLUG IS NOT FORCED ONTO THE RECEPTACLE ON THE RECEIVER BUT THAT IT IS ASSEMBLED PROPERLY. Then remove one of the screws in the end of the chassis and fasten the clip at the end of the shield to the chassis holding it in place by means of this screw.

Pull the switch underneath the tuning control forward. Never turn this switch on unless the receiver is plugged into the harness assembly, thus making sure that the power supply is operating under load.

FINAL ADJUSTMENT - MODEL "10 A" ALL ELECTRIC AND MODEL "10 E" BATTERY TYPE

The installation is now complete with the exception of the elimination of certain noises known as interference, caused by the ignition system. You will find in the MotoVox package a complete set of suppressors for both coil and spark plugs for a six cylinder automobile. Assemble a spark plug resistor on each plug, (Diagrams #1 and #2) making sure that all connections are tight, as a loose connection at this particular point will render the resistor useless as well as interfere with the operation of the motor. Install the single coil suppressor provided in the top of the distributor.

In most cases the standard suppressors are very easily mounted. However, in the case of certain valve-in head motors, such as the Buick, it is necessary to use the MotoVox screw-in type suppressor which can be screwed into the ignition cable and then snapped over the plug. Be certain at all times that in the case of a two coil system, that there is one coil suppressor in each high tension lead going to each coil at the distributor. the screw-in type suppressor can be purchased from Moto Meter at a nominal charge.

In addition to the suppressors, there are two by-pass condensers provided. One of these by-pass condensers should be placed on the live side of the generator, mounting the condenser bracket under the relay mounting screw and connecting the lead to the relay battery terminal. The other condenser should be mounted on the battery side of the coil. The can of condenser must be grounded.

MOTO-METER GAUGE & EQUIPMENT CO.

MODEL 10-A,10-E
Moto-Vox
Notes

ALIGNING RECEIVER WHEN REPLACING COILS

Since all of the adjustable condensers in this receiver have been accurately aligned in the process of manufacturing, it will only be necessary to adjust them when replacing one or more coils. This operation may be divided into two parts namely, First, Aligning intermediate frequency transformer trimmers and Second, Aligning gang condenser and series condenser trimmers.

ALIGNING INTERMEDIATE FREQUENCY TRANSFORMER TRIMMERS WHEN REPLACING INTERMEDIATE FREQUENCY TRANSFORMER "71" PART #76502 OR COMPOSITE UNIT "68" PART #76499.

Remove any external antenna from chassis and ground antenna on chassis during test. Connect one of the output leads of a 175 K.C. test oscillator to the control grid (top) cap of first detector tube (leaving grid cap terminal of lead in place on tube) and the other to the base of chassis. Connect an output meter in parallel with the primary of speaker output transformer at the terminal strip in the speaker housing. Turn the rotor plates entirely out of stator plates and adjust the adjustable trimmer in the top of coil "71" to the maximum meter reading. Then adjust the trimmers in the top of composite "68" to maximum reading in the same manner. When this is accomplished the intermediate frequency of the receiver has been aligned to 175 K.C.

ALIGNING GANG CONDENSER TRIMMER AND SERIES TRIMMERS

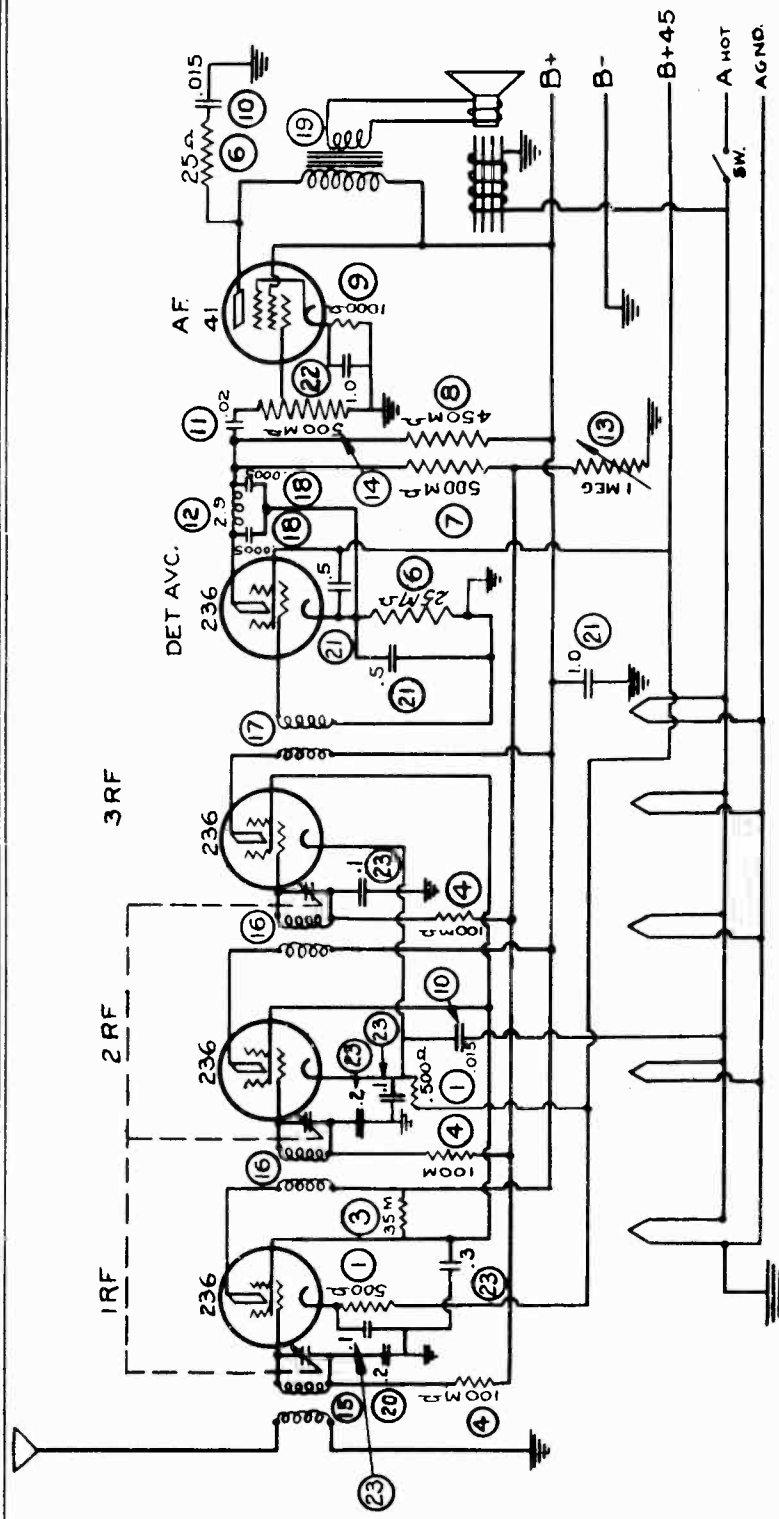
When replacing a gang condenser, series trimmers, composite, antenna, or R.F. coil it is necessary to realign the series trimmer and gang condenser trimmers. To do this fasten the tuning control to the chassis, turning the rotor blades all the way into the stator and setting the dial on 540 K.C. Now adjust a test oscillator to 600 K.C. and place one terminal on the base of the chassis and the other on the antenna post of the receiver. (Remove the ground from this post). Connect the output meter as described above. Now rotate the tuning mechanism slowly back and forth at approximately 600 K.C. on the dial and adjust the series trimmer so that maximum reading is shown on the meter. During these measurements reduce the signal from the oscillator to approximately one half scale reading.

Now adjust the test oscillator to 1400 K.C., tune the receiver to 1400 K.C. on the dial and adjust the three trimmer condensers on the gang condenser to the maximum meter reading.

If the proper coil is used and the tuning condenser is calibrated properly, the maximum output will be obtained at each of the other frequencies. In some cases, however, after aligning at 1400, it may be necessary to bend the outside blades at the other frequencies to track properly. This should only be done by an experienced radio service man and the receiver should always be aligned last at 1400 K.C.

MODEL 10-E
Moto-Vox
Schematic
Voltage

MOTO-METER GAUGE & EQUIPMENT CO.



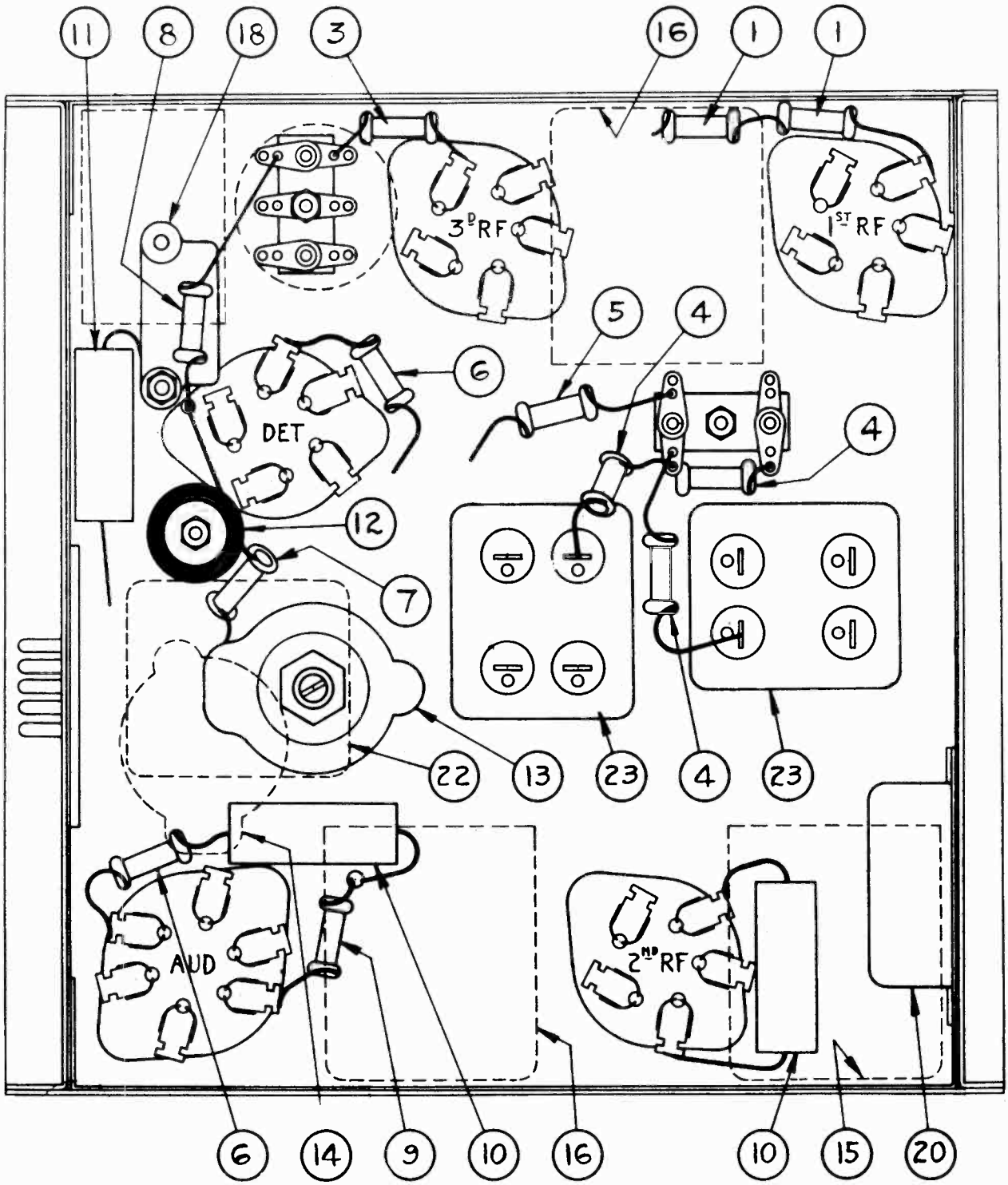
TUBE						
TYPE	PURPOSE	FILAMENT	CATHODE to GROUND	CATHODE to SCREEN	CATHODE to PLATE	Plus 45 to CATHODE
36	1st. R.F.	5.6	-	60	135	1.9
36	2nd. R.F.	5.6	-	59	134	3.0
36	3rd. R.F.	5.6	-	59	134	3.0
36	Detector	5.6	3 to 4	40	50 to 70	-
41	Audio	5.6	16.0	165	155	-

Take readings at tube socket contacts when receiver is tuned off signal.

Total Drain 19 milliamperes.

MOTO-METER GAUGE & EQUIPMENT CO.

MODEL 10-E
Moto-Vox
Chassis
Socket



MODEL 10-E BATTERY OPERATED

MODEL Moto-Vox 10-E
Battery
General notes

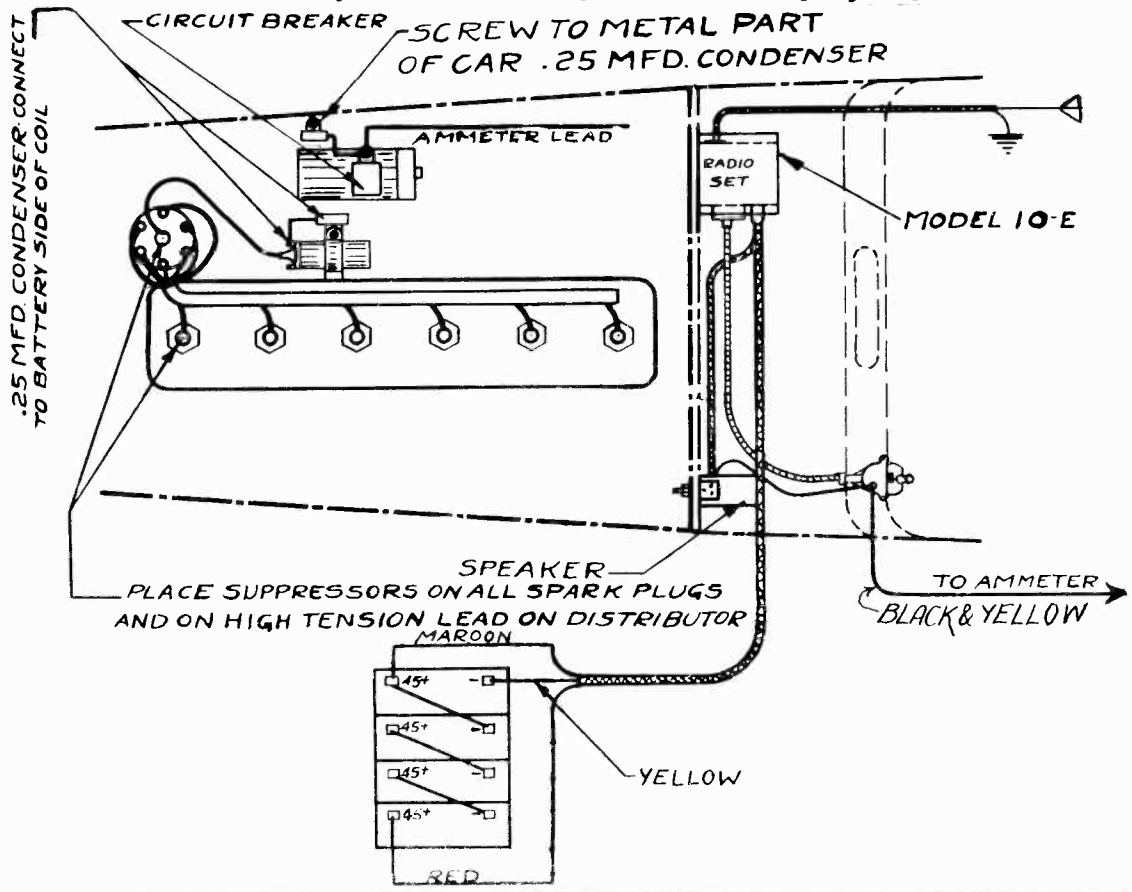
MOTO-METER GAUGE & EQUIPMENT CO.

SPECIAL INSTRUCTIONS FOR MODEL "10 E" BATTERY RECEIVER

In the case of Model "10 E", it is only necessary to assemble the Yellow lead in the "B" harness to the minus tap of 180 volts of battery. (Schematic Diagram #2) Four Type 2308 Burgess Batteries are recommended for this purpose. Then the Maroon lead is assembled onto plus 45 and the Red lead is assembled to plus 180. A 1/4 amp. 250 mil. fuse is provided in the plus 180 line to avoid possible damage due to short circuits to different parts of the radio circuit.

In most cases it is possible to mount the batteries underneath the seat, or in rear of either front or back seat. In case this is not possible a battery box can be obtained at a very nominal cost from the factory. It must be remembered that Model "10 A" and "10 E" are not interchangeable as far as hook-up is concerned. Model "10 A" is an All Electric Set and Model "10E" is Battery Operated and these circuits are wired accordingly. Therefore, it is not possible to operate the Model "10 A" as a battery receiver and the Model "10 E" as an all electric.

After the installation is completed, the receiver is now ready for sensitivity adjustment. Turn the receiver switch on and turn the dial off of a broadcast station between 1300 and 1500 kilocycles. The noise level at this point should be fairly high. Now turn the sensitivity control, AN EXCLUSIVE MOTOVOX FEATURE, located in the bottom of the receiver, entirely to the right or clockwise to the "Stop", then turn back counter-clockwise or to the left, until the point is reached at which the static level becomes very high. This is the point of maximum sensitivity. Any point beyond this in a counter-clockwise direction or to the left, will result in a lower sensitivity level and in a clockwise or right direction will result in a lack of sensitivity and automatic volume control. It is suggested that the control be set at a point just below the maximum sensitivity to reduce engine interference. Therefore, be certain at all times that the sensitivity control is adjusted at the proper point.



MOTO-METER GAUGE & EQUIPMENT CO.

MODEL Moto-Vox 10-A
10-E
Special notes

INSTALLATION PROCEDURE

The model installation which is strongly recommended is to place the chassis on the right hand side of the dash as far up in the corner as it is possible and to place the tuning control unit on the left hand side of the instrument panel putting the speaker directly back of tuning control on the left hand side of dash.

The chassis may be mounted in any desired position. It is necessary to drill four clearance holes for 1/4" bolts and it is recommended that the four mounting bolts provided be secured to the case with the nuts provided, and then the complete chassis can be held against the dash marking the location of the four holes.

If it is desired, MotoVox has an accessory mounting bracket #76495, which can be obtained at all MotoVox distributors at a very nominal cost. This bracket permits the receiver to be mounted by drilling only one hole in the dash. In removing the receiver it is unnecessary to remove the bracket, but merely two mounting screws which secure the receiver to the bracket. For further instructions see directions accompanying the bracket.

The tuning control and speaker cable assembly are all completely attached and assembled together at the factory and it is only necessary to drill a clearance hole for a 3/8" bolt to mount the speaker on the dash. In case the bracket mounting which is provided for the speaker is not adaptable to the particular installation at hand, it is necessary to remove the cover, unfasten the mounting bolt and screw the mounting bolt in place in the tapped stud in the rear of the speaker. If this mounting is used be sure to space the speaker away from the dash at least 1½". In using the conventional mounting the speaker should be placed in such a manner that the face of the speaker, that is, the side on which screw heads show, should be mounted toward the center of the car, thus, giving a clear tone. The tuning control is fastened to the edge of instrument panel with two 1/4" screws provided.

MOUNTING CHASSIS AND TUNING CONTROL

In mounting the chassis to the dash, make sure that the tuning control bracket on the case is mounted in such a manner that it faces towards the tuning control, then assemble the tuning control to the chassis proper. Pull the short shaft and coupling extending through the side of the chassis entirely out and turn as far clockwise as possible. Then turn the tuning control knob in the same position and insert the driver on the end of the flexible shaft in the coupling. Then tighten the two screws in the coupling. Now insert the metal conduit on the outside of the flexible shaft in the tuning control bracket on the end of the case and tighten the two set screws in this bracket.

Run the drive shaft and the tuning control to the chassis in as direct a manner as possible, thus eliminating all kinks and bends which would tend to make the drive bind. REMEMBER THAT THE SUCCESS OF THIS PARTICULAR TYPE OF CONTROL DEPENDS UPON SMOOTH OPERATION AND THIS CAN ONLY BE ACCOMPLISHED BY PROPERLY LINING UP THE PARTS. Care has been taken in the manufacture of these parts in the factory and only by properly assembled jobs in the field can good results be obtained.

The final adjustment on the dial calibrations can be obtained after the power supply and the receiver are completely hooked up by tuning in on broadcasting stations. It is then a comparatively simple operation to loosen the coupling on the flexible cable by means of the two set screws, rotate the dial to the proper position and re-tighten these screws. Be sure that the screw which holds the tuning control conduit in the tuning control housing does not bind too tightly as this may cause an excessive bind on the flexible cable. It is recommended that the Receiver be tuned on a Broadcasting Station approximately 700 Kilocycles in making the above adjustment.

MODEL 10-A, 10-E
Parts List

MOTO-METER GAUGE & EQUIPMENT CO.

SERVICE PARTS

DESCRIPTION	NAME	MOTO METER PART NO.
1	Resistor 500 ohms	76303
2	Resistor 50,000 ohms	76309
3	Resistor 35,000 ohms	76302
4	Resistor 100,000 ohms	76300
5	Resistor 1,000,000 ohms	76308
6	Resistor 25,000 ohms	76301
7	Resistor 500,000 ohms	76304
8	Resistor 450,000 ohms	76305
9	Resistor 1000 ohms	76306
10	Condenser .015 mfd.	76350
11	Condenser .02 mfd.	76351
12	Choke Coil	76071
13	Sensitivity Control	76069
14	Volume Control	76460
15	Antenna Coil Assembly	76058
16	R.F. Coil Assembly	76060
17	Untuned Transformer Assembly	76039
18	Condenser .0005 mfd.	76251
19	Output Transformer	76450
20	Condenser 0.2 mfd.	76063
21	Condenser .5, .5 and 1.0 mfd.	76050
22	Condenser 1.0 mfd.	76045
23	Condenser .1, .1.1 and .1 mfd.	76064
24	Case Assembly Drive Screws	76002
25	Terminal Plug (Male)	76015
26	R.F. Tube (Type 36)	76020
27	Output Tube (Type 41)	76021
28	Tuning Condenser	76080
29	Volume Control Pinion	76051
30	Tube Socket (Type 36)	76065
31	Tube Socket (Type 41)	76067
32	Terminal Strip	76072
33	Antenna Lead-in Assembly	76407
34	Tuning Control Bottom Cover Assembly	76081
35	Switch & Nut	76083
36	Dial Light Bulb	76086
37	Control Housing	76091
38	Control Knob	76095
39	Dial Assembly	76094
40	Flexible Conduit	76402
41	Control Cable Assembly	76098
42	Control Harness Assembly	76412
43	Cable Plug (Female)	76414
44	Spark Suppressor (Standard)	76415
45	Coil Suppressor (Standard)	76416
46	Screw-In Suppressor	76449
47	1/4 amp. Fuse	76418
48	Interference Eliminator Condenser	76421
49	Speaker Assembly less Case	76431
50	Speaker Cone Assembly	76496
51	Resistor (250,000 ohms)	76307
52	Condenser (2.0 mfd.)	76451
53	Choke (Low Frequency)	76459
54	Choke (High Frequency)	76462
55	Condenser (.00025 mfd.) Bakelite	76456
56	Condenser (.04 mfd.) 200 volt	76457
57	Autoformer	76463
58	Condenser (4.0 mfd.) 25 Volt Electrolytic	76458
59	Condenser (.001 mfd.) Bakelite	76253
60	Resistor (10,000 ohms)	76310
61	Condenser (.003 mfd.) 200 volts	76353
62	Resistor (250 ohms)	76312
63	Tube Socket (Type 85)	76454
64	Output Tube (Type 85)	76455

SERVICE PARTS

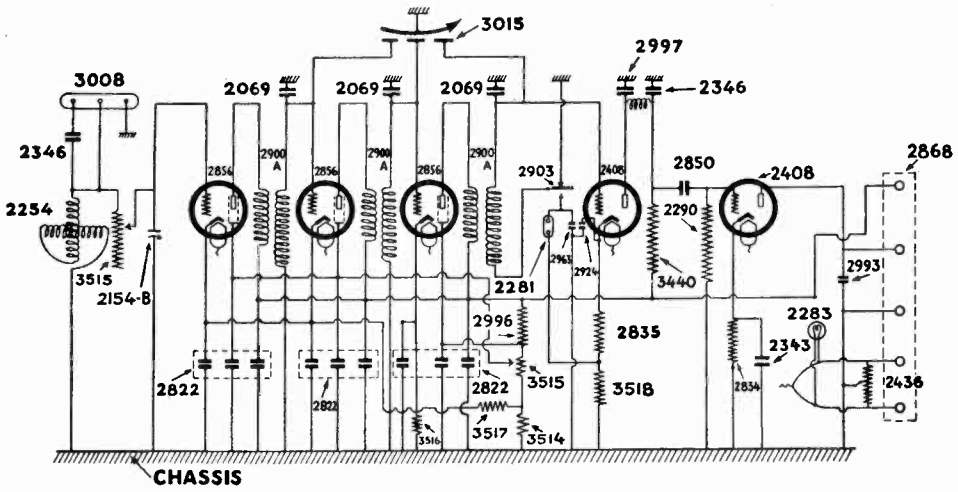
MODEL 10A ALL ELECTRIC

SERIAL NOS. ABOVE 500.

DESCRIPTION	NAME	MOTO METER PART NO.
65	Resistor (8000 ohms.)	76313
66	Condenser (.002 Mfd.)	76254
67	Series Trimmer	76498
68	Composite Unit	76499
69	Antenna Coil	76500
70	R F Coil	76501
71	Intermediate Freq. Transformer	76502
72	Type 36 Socket (1-1/8" Mtg. Center	76503
73	Resistor (1000 ohms) 1/2 Watt.	76311

MODEL 52,53,54
Changes

NATIONAL CARBON CO.



Part No. 3515—Variable resistance in the antennae circuit functions only during the last quarter turn as the volume control is rotated counterclockwise.

Schematic diagram of wiring for Series 50 R. F. Unit as shown on blueprint of WMD **3048-B.**

The following lists are of parts added to and omitted from schematic diagram of R. F. Unit shown on page 41.

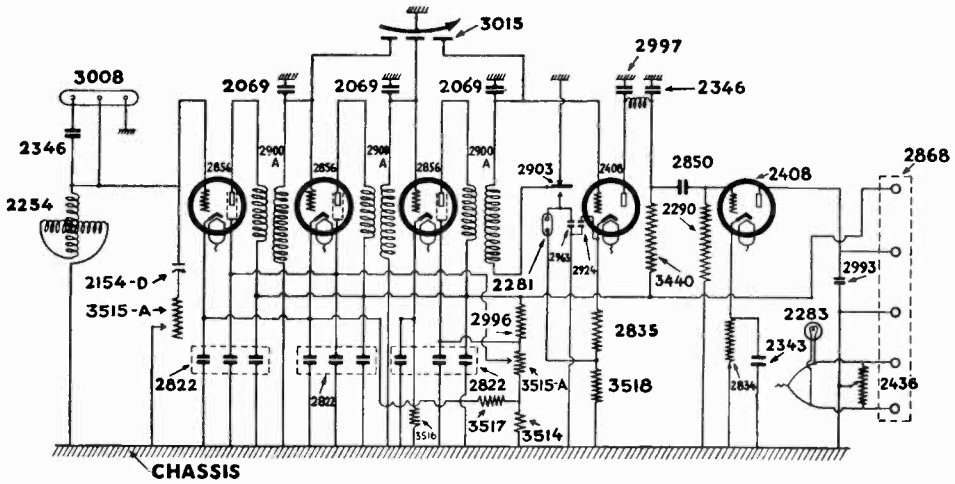
Parts Added

No.	Description
2406	Volume control insulating washer
2407	Volume control insulating bushing
3514	35 ohm wire wound resistor
3515	Volume control:—Wire wound
3516	1150 ohm carbon resistor
3517	260 ohm carbon resistor
3518	50000 ohm carbon resistor

Parts Omitted

No.	Description
2338	2500 ohm wire wound resistor
*2835	4000 ohm carbon resistor
2917	Volume control
3004	200 ohm carbon resistor

*One part No. 2835 remains in R. F. Unit.



Part No. 3515A—Variable resistance in the antennae circuit functions only during the last quarter turn as the volume control is rotated counterclockwise.

Schematic diagram of wiring for Series 50 R. F. Unit as shown on blueprint of WMD **3048-C.**

The following lists are of parts added to and omitted from schematic diagram of R. F. Unit shown at top of this page.

Parts Added

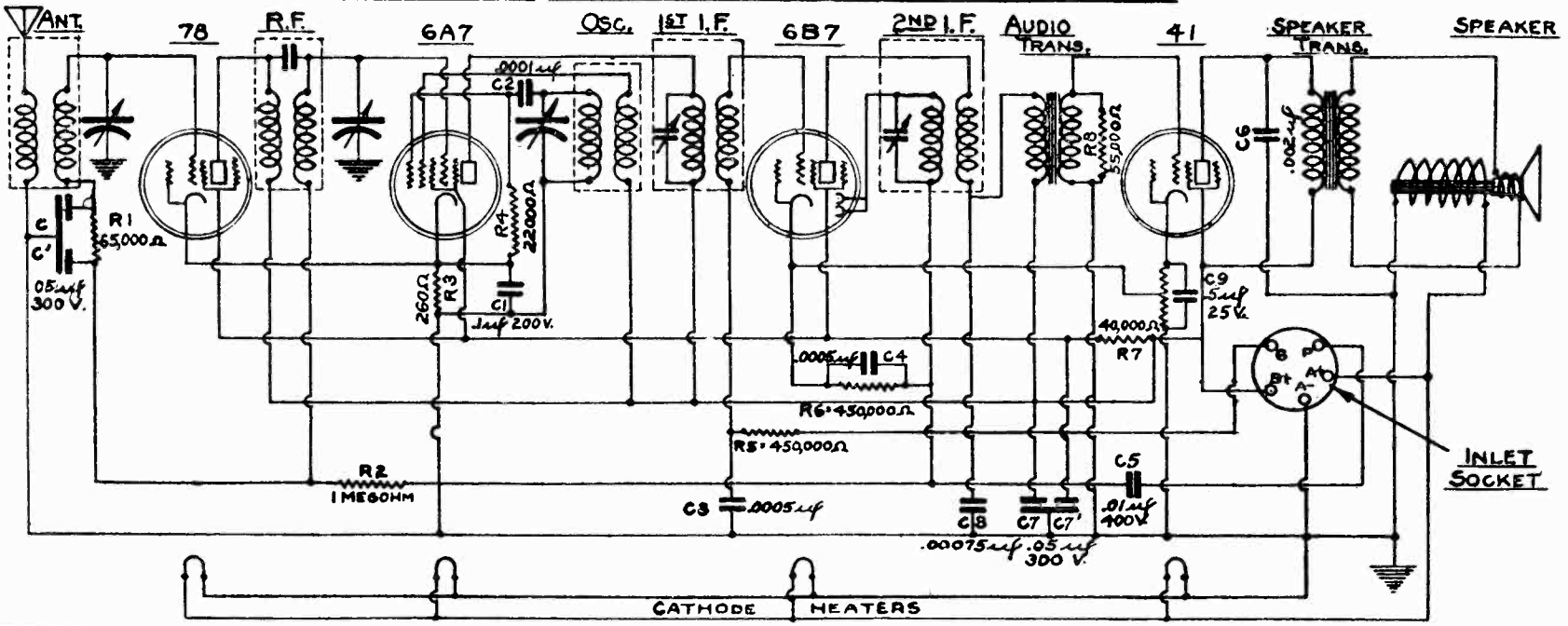
No.	Description
2154-D	Trimming condenser
3515-A	Volume control

Parts Omitted

No.	Description
2154-B	Trimming condenser
2406	Volume control insulating washer
2407	Volume control insulating bushing
3515	Volume control

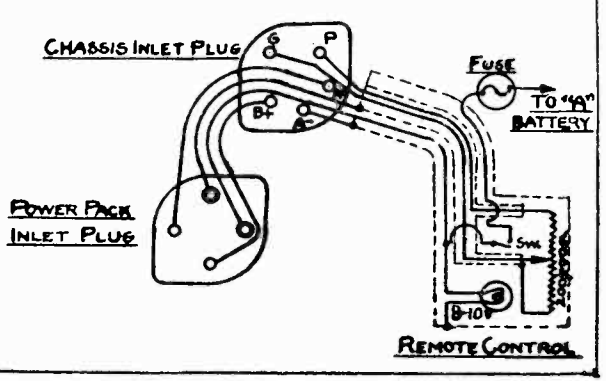
ARVIN CAR RADIO MODEL 10A

RADIO FREQUENCY, SPEAKER & REMOTE CONTROL CIRCUIT DIAGRAM



WIRING COLOR CODE			CAPACITY VALUES				RESISTANCE VALUES		
			SIGN	mf		P.V.D.C.	SIGN	Ω	WATTS
R.F. CHASSIS	CATHODES	YELLOW							
	NEG. "A", NEG. HEATER & GROUND	BLACK	C	.5	TWIN	300	R1	65,000	
	POS. "A" & POS. HEATER	YELLOW	C'	.5	TWIN	300	R2	1,000,000	
	CONTROL GRIDS	GREEN	C1	.1		200	R3	260	
	PLATES	BLUE	C2	.0001			R4	22,000	
	"B" POS. & SCREEN GRIDS	RED	C3	.0005			R5	450,000	
SPEAKER	"A" POS. TO SPEAKER	YELLOW	C4	.0005			R6	450,000	
	"A" NEG. TO SPEAKER	BLACK	C5	.01		400	R7	40,000	
	SPEAKER TRANS. LEAD	RED	C6	.002		600	R8	55,000	
	SPEAKER TRANS. RETURN LEAD	BROWN	C7	.5	TWIN	300			
REMOTE CONTROL	"A" POS. BATTERY TO SWITCH	BLACK	C7'	.5	TWIN	300			
	SWITCH TO POWER PACK	YELLOW	C8	.00075					
	"G" TO ROTATING CONTACT	GREEN	C9	.5		.25			
	"P" TO VOLUME CONTROL	BLUE							
	SWITCH TO LAMP BULB	RED							

IF PEAK 175 KC



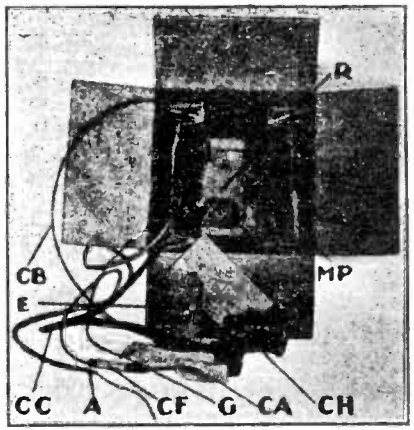
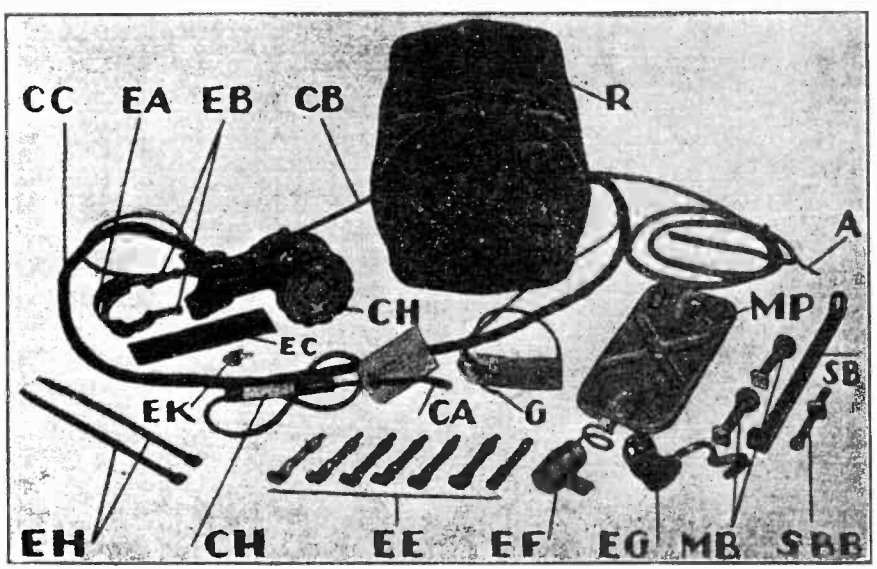


FIGURE 15

You can play the radio before taking it from the carton. To do so attach antenna lead A to any convenient aerial. Connect the wires CA and G to a six-volt storage battery. Obtain the key from sack E and turn on the switch in the center of the control head. Now tune the radio by rotating the large bakelite control knob.

Here's how it looks when first taken from the carton and spread out for examination. Please examine these parts carefully and identify them by the following key:

A —Shielded antenna lead
CA —Ammeter lead
CB —Bowden wire
CC —Control cable
CF —Fuse
CH —Remote control
EA —Steering column strap
EB —Strap screws
EC —Felt pad
EE —Suppressors
EF —Generator condenser
EG —Bonding ribbon
EH —Cable tie down strap
EK —Key
MB —Mounting bolts
MP —Mounting plate
SB —Stabilizing bracket
SBB —Stabilizing bracket bolts



FIGU RE 16

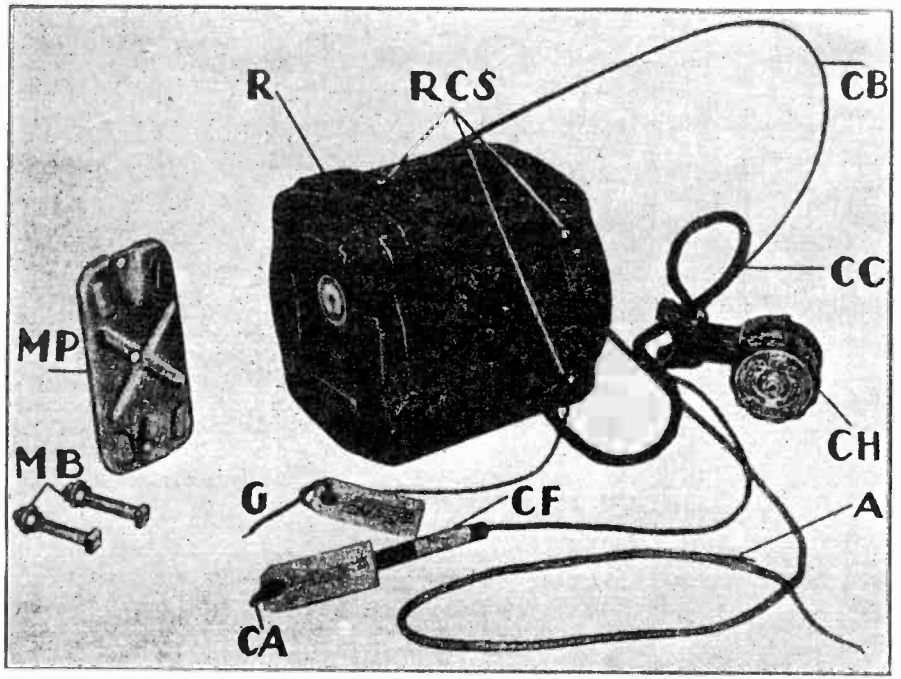


FIGURE 17

TO INSTALL: The model 10A has been designed to permit easy installation. By careful attention to the following instructions any one should be able to properly install an Arvin Model 10A with satisfactory results. The entire radio mounts under the dash of the car on mounting plate MP. Using this plate as a template mark the holes for mounting on the bulkhead. In selecting this position on the bulkhead care should be taken to see that the relationship between the remote control on the steering column and the radio on the bulkhead is such that the Bowden control cable will be as short and straight as possible. This will tend to make the control turn smoothly and be more uniformly accurate. Drill the holes in the bulkhead as marked using a 17/32 diameter drill.

Due to the unique Arvin design the radio may be mounted either horizontally or vertically and by one, two or three bolts. Two bolts MB are supplied as this type of mounting has been found most satisfactory. Next slide MP with bolt MB in place on to the tapered wedges on the back of radio case R, making sure that the sides of these wedges take hold in the channels of the mounting plate MP, as shown in figure 18. Using a light hammer tap this plate in place to make sure of a solid mounting. Next put the bolts in the bulkhead and secure them with the washers and nuts furnished. Pull these nuts up as tight as possible to make the bulkhead insulation pack down solid.

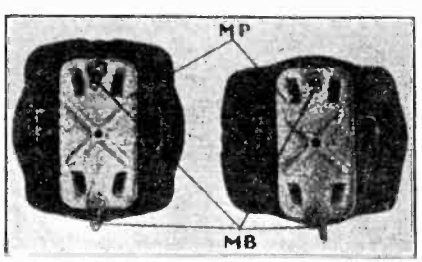


FIGURE 18

To Change Remote Control or Shorten Bowden Wire Cable

First, remove screw RT from the radio chassis (figure 22) and raise strap TS up out of the way pivoting it at the rivet on the front end of the chassis. This will give you ample room to work on the condenser pulley wheel and on the Bowden wire cable. To remove this cable it is merely necessary to remove or loose screw CPS on the pulley wheel to allow the tiller wire to be taken loose and then to loosen screw CBS on Bracket CBC to allow the Bowden wire to be pulled out of the clamp. Now measure the Bowden wire to obtain the proper length which will give the most efficient control. Set the remote control dial at zero and cut off the Bowden cable by proceeding as follows. To cut the cable armor score slightly with a file on opposite sides and break by bending. This avoids danger of cutting into a cable strand causing it to tangle. Next, cut the tiller wire approximately four inches from the end of the Bowden cable. This will allow you sufficient slack to be sure you do not have the tiller wire short. Now replace the Bowden wire in the cable clamp on the condenser frame and tighten down screw CBS. Then turn the remote control dial to 100 and wrap the tiller wire around the pulley screw and under the washer on screw CPS. Tighten this screw down tight. Then cut off any excess strands of tiller wire to prevent this wire from tangling or scraping on any of the surrounding metal parts of the chassis.

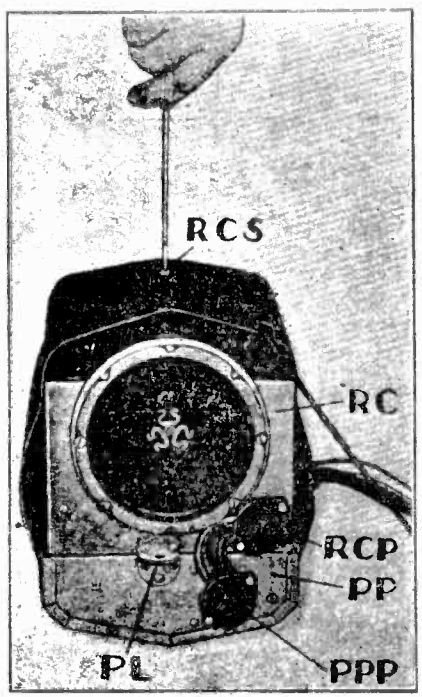


FIGURE 20

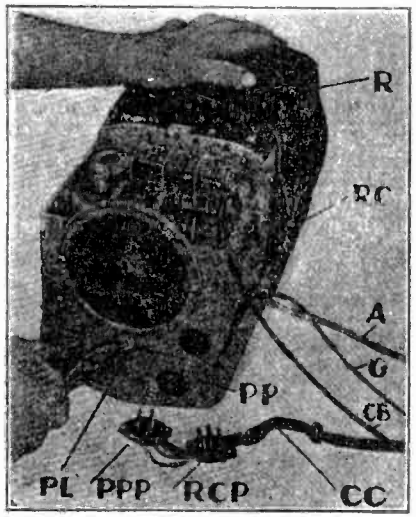


FIGURE 21

To Replace Tubes

No special instructions are necessary for replacing tubes in the model 10A chassis as every tube is very accessible. However, a word of caution—tubes with six and seven prongs such as 78, 6A7 and 6B7 have a very considerable socket contact friction and therefore it is wise to be sure you have pressed the tubes down firmly in place. Be sure that the tubes are seated all the way home, otherwise the grid cap may touch the mounting case of the radio and short out. A little precaution in this matter may save considerable trouble from a service standpoint after the radio has been installed. Also make sure that the grid clips on the tops of the tubes make good contact by pinching these clips slightly before placing them on the tube caps.

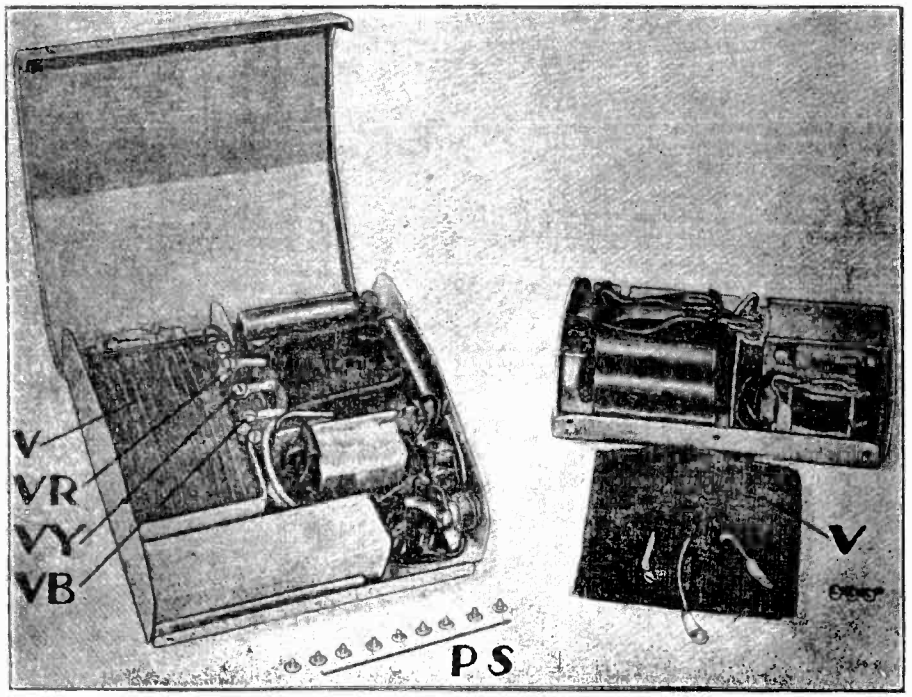


FIGURE 23

To Replace Vibrator

Remove power pack cover screws PS (figure 23) and lift off the cover. The entire power pack assembly and parts will then be exposed to view. To remove the vibrator remove screws VR, VY and VB and lift the rubber case in which the vibrator is packed out of the vibrator well. When replacing the vibrator make sure that the red lead is fastened under screw VR, the yellow lead under screw VY and the blue lead under screw VB. Then replace the cover in reverse order as it was taken off, making sure that the screws are pulled up tight to hold the cover on. This is very important and has a very definite bearing in relation to the amount of RF interference which the power pack will radiate.

MODEL Arvin 20-A
Schematic
Type 2

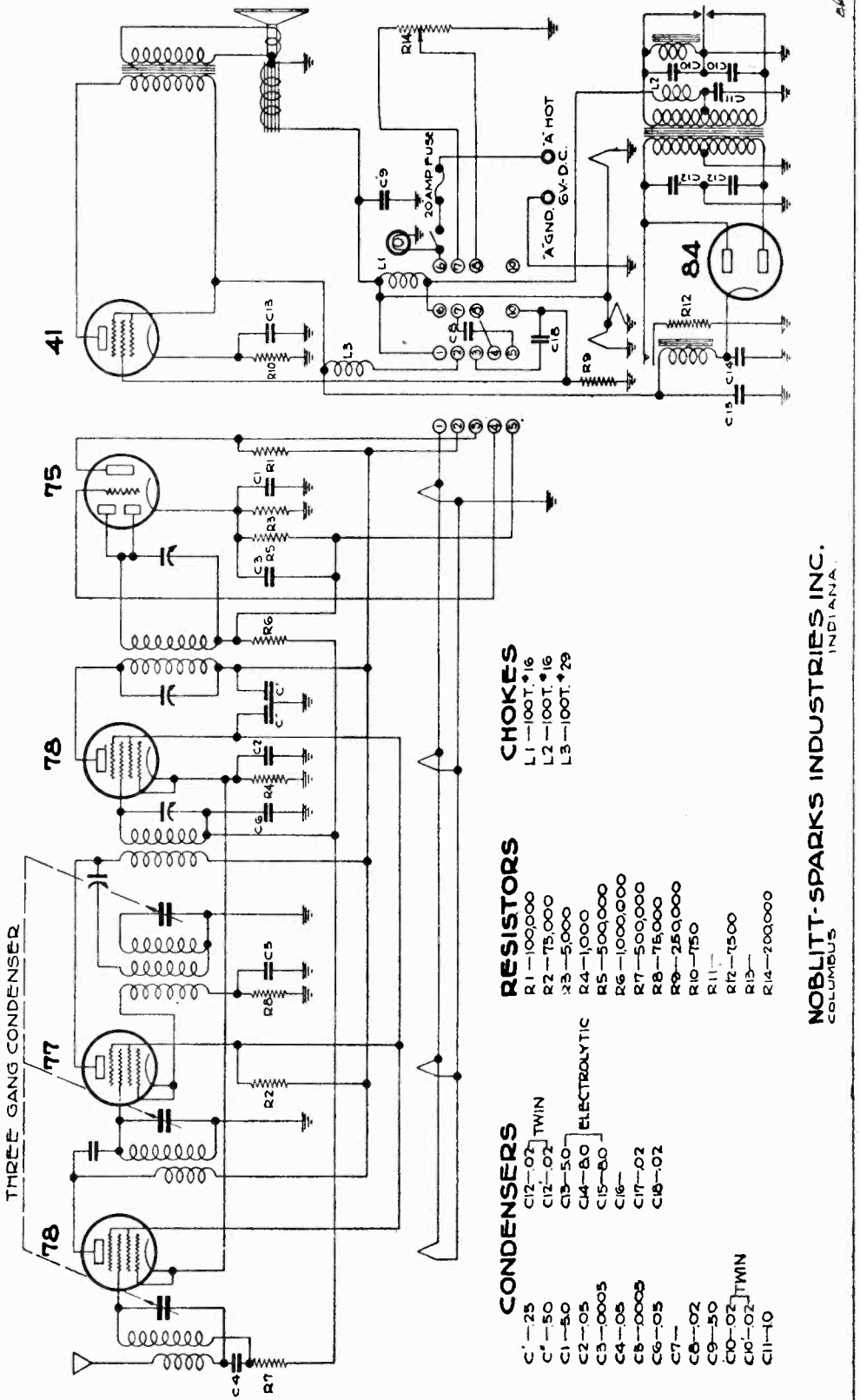
NOBLITT SPARKS INDUSTRIES

DIAGRAM	ISSUE NO	DATE
C	1	6-27-33
C	2	7-15-33

SCHEMATIC CIRCUIT DIAGRAM
ARVIN CAR RADIO MODEL 20A

IF PEAK 181.5 KC

THREE GANG CONDENSER



CONDENSERS

C'—.25
C'—.50
C1—.50
C2—.05
C3—.0005
C4—.05
C5—.0005
C6—.05
C7—
C8—.02
C9—.50
C10—.02 TWIN
C10'—.02
C11—10
C12—.02 TWIN
C12'—.02
C13—.50
C14—8.0 ELECTROLYTIC
C15—8.0
C16—
C17—.02
C18—.02

RESISTORS

R1—100,000
R2—75,000
R3—5,000
R4—1,000
R5—500,000
R6—1000,000
R7—500,000
R8—75,000
R9—250,000
R10—750
R11—
R12—7500
R13—
R14—200000

CHOKES

L1—100T.#16
L2—100T.#16
L3—100T.#29

NOBLITT-SPARKS INDUSTRIES INC.
COLUMBUS INDIANA

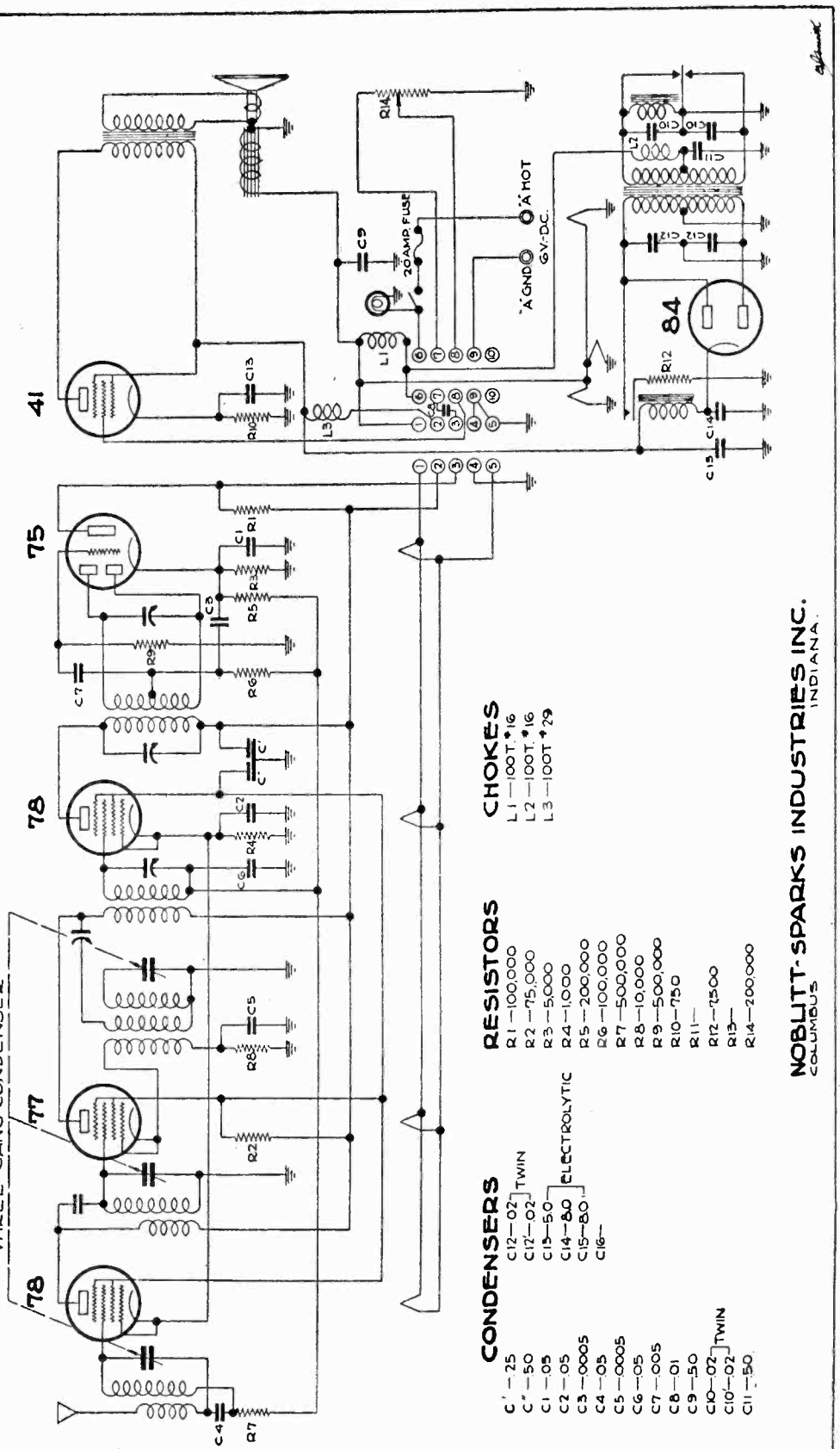
NOBLITT SPARKS INDUSTRIES

MODEL Arvin 20-A
Schematic
Type 1

DIAGRAM	ISSUE NO.	DATE
B	1	4-26-33
B	2	7-9-33

SCHEMATIC CIRCUIT DIAGRAM
ARVIN CAR RADIO MODEL 20A

IF PEAK 181.5 KC



CONDENSERS

C' — 25	C12—02	TWIN
C" — 50	C12'—02	
C1 — 05	C13—5.0	ELECTROLYTIC
C2 — 05	C14—8.0	
C3 —.0005	C15—8.0	
C4 — 05	C16—	
C5 —.0005		
C6 — 05		
C7 — 005		
C8 — 01		
C9 — 50		
C10—02	TWIN	
C10'—02		
C11 — 50		

RESISTORS

R1 — 100,000
R2 — 75,000
R3 — 5,000
R4 — 1,000
R5 — 200,000
R6 — 100,000
R7 — 500,000
R8 — 10,000
R9 — 500,000
R10 — 750
R11 —
R12 — 7500
R13 —
R14 — 200,000

CHOKES

L1 — 100T #16
L2 — 100T #16
L3 — 100T #29

NOBLITT-SPARKS INDUSTRIES INC.
COLUMBUS INDIANA

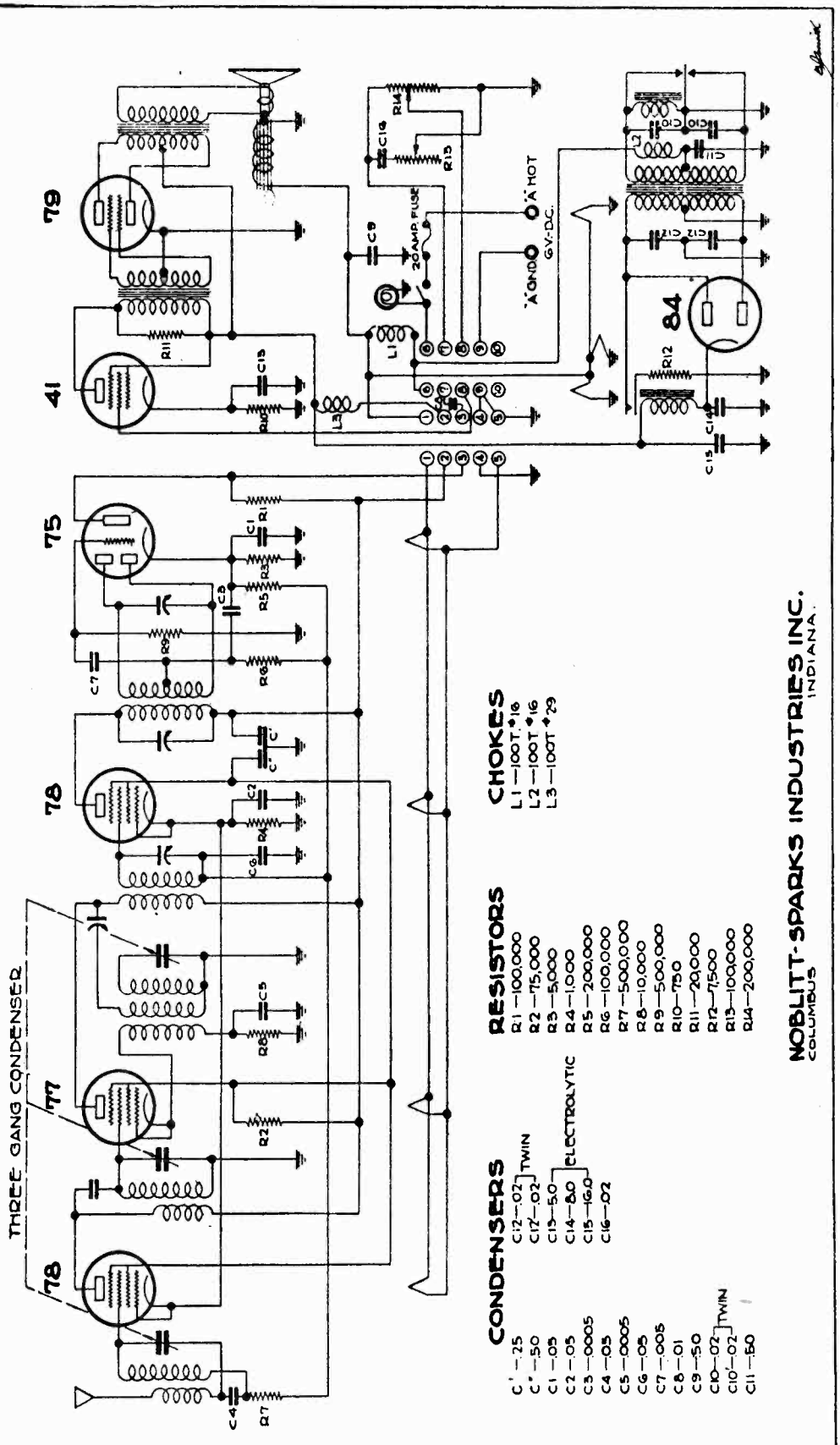
MODEL Arvin 30-A
Schematic
Type 1

NOBLITT SPARKS INDUSTRIES

DIAGRAM	ISSUE NO.	DATE
B	1	4-26-33
B	2	7-9-33

SCHEMATIC CIRCUIT DIAGRAM
ARVIN CAR RADIO MODEL 30A

IF PEAK 181.5 KC



CONDENSERS

C' —.25
C" —.50
C1 —.05
C2 —.05
C3 —.0005
C4 —.05
C5 —.0005
C6 —.05
C7 —.005
C8 —.01
C9 —.50
C10—.02 TWIN
C10—.02 TWIN
C11 —.50
C12—.02 TWIN
C12—.02 TWIN
C13—5.0 ELECTROLYTIC
C14—8.0 ELECTROLYTIC
C15—16.0 ELECTROLYTIC
C16—.02

RESISTORS

R1 —100,000
R2 —75,000
R3 —5,000
R4 —1,000
R5 —200,000
R6 —100,000
R7 —500,000
R8 —10,000
R9 —500,000
R10—750
R11—20,000
R12—7,500
R13—100,000
R14—200,000

CHOKES

L1 —100T #16
L2 —100T #16
L3 —100T #29

NOBLITT-SPARKS INDUSTRIES INC.
COLUMBUS INDIANA

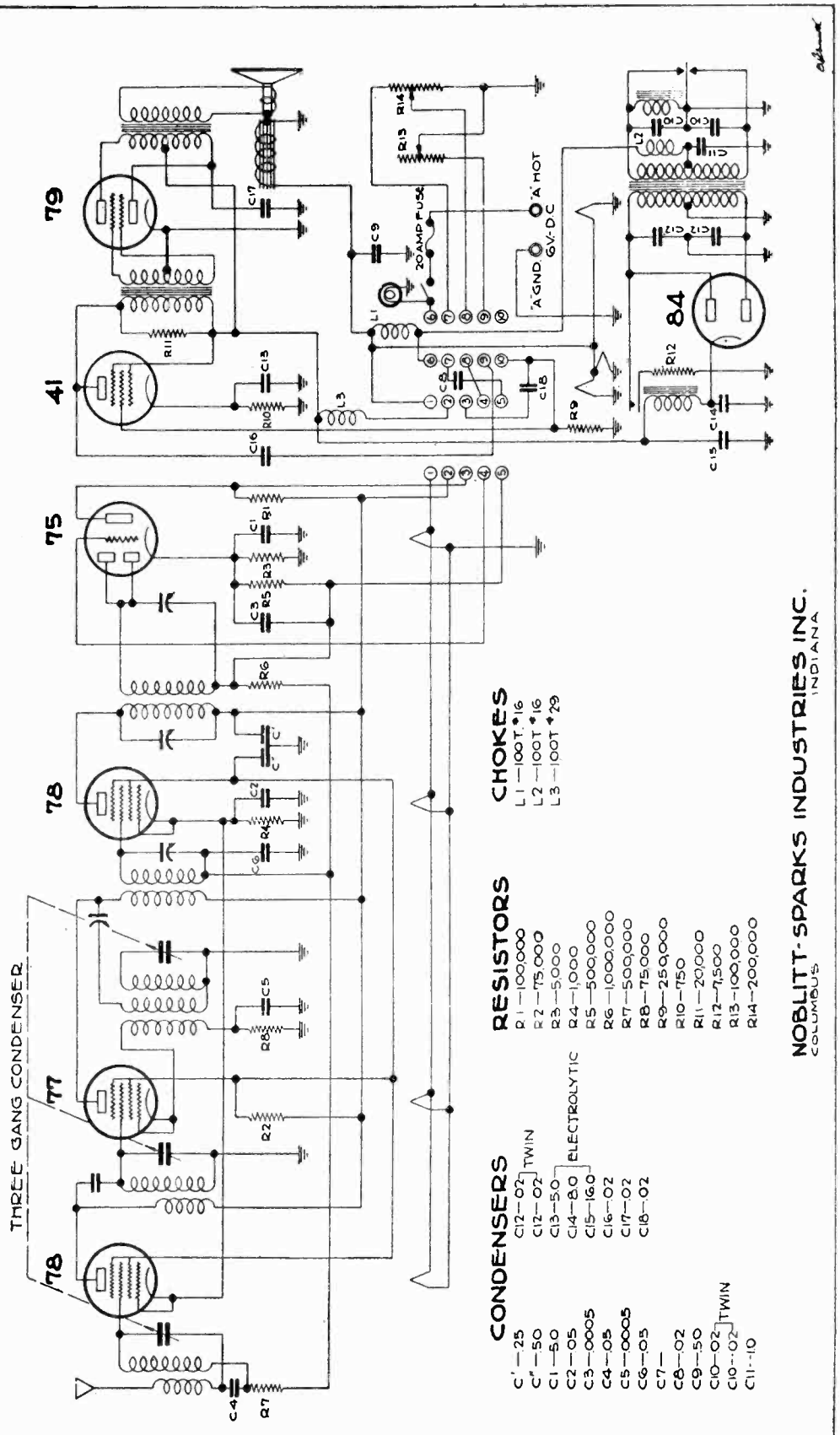
NOBLITT SPARKS INDUSTRIES

MODEL Arvin 30-A
Schematic
Type 2

DIAGRAM	ISSUE NO.	DATE
C	1	6-27-33
C	2	7-15-33

SCHEMATIC CIRCUIT DIAGRAM
ARVIN CAR RADIO MODEL 30A

IF PEAK 181.5 KC



CONDENSERS

C'—25
C"—50
C1—50
C2—05
C3—0005
C4—05
C5—0005
C6—05
C7—
C8—02
C9—50
C10—02 TWIN
C11—10
C12—02 TWIN
C12—02
C13—5.0 ELECTROLYTIC
C14—8.0
C15—16.0
C16—02
C17—02
C18—02

RESISTORS

R1—100,000
R2—75,000
R3—5,000
R4—1,000
R5—500,000
R6—1,000,000
R7—500,000
R8—75,000
R9—250,000
R10—750
R11—20,000
R12—7,500
R13—100,000
R14—200,000

CHOKES

L1—100T #16
L2—100T #16
L3—100T #29

NOBLITT-SPARKS INDUSTRIES INC.
COLUMBUS INDIANA

MODEL Arvin 30-A
Resistance Data
Voltage Data

NOBLITT SPARKS INDUSTRIES

RESISTANCE CHART

(A plus, A minus and B minus must be connected together on terminal strip while making resistance check.)

1ST STAGE—78 TUBE

	MAXIMUM	MINIMUM
Control grid to ground	705,000 ohms	600,000
Control grid to common between R4 and R6	500,000 ohms	400,000
Antenna Post on Coil to ground	4 ohms	2.5 ohms
Screen Grid to Plate No. 75 Tube	190,000	150,000
Plate to Plate No. 75 Tube	100,000	80,000
Suppressor Grid to Cathode	0	0
Suppressor Grid and Cathode to Ground	1,000	850
Plate to Screen Grid	75,000	60,000
Plate to B plus	45	45
Filaments	0	0

2ND STAGE—77 TUBE

Control Grid to Ground	7.5	6.5
Screen Grid to Plate No. 75 Tube	120,000	150,000
Plate to Plate No. 75 Tube	100,000	80,000
Screen Grid to Plate	75,000	60,000
Suppressor Grid to Cathode	0	0
Suppressor Grid and Cathode to Ground	10,000	8,500
Plate to B plus	30	30
Filaments	0	0
No. 2 Terminal first I. F. to Ground	5 ohms	3.5 ohms
Stator Oscillator Variable Condenser to Ground	4 ohms	3 ohms

3RD STAGE—78 TUBE

Control Grid to Ground	210,000	190,000
Control Grid to common between R5 and R6	50 ohms	50 ohms
Screen Grid to Plate No. 75 Tube	190,000	150,000
Plate to Screen Grid	75,000	60,000
Plate to Plate of No. 75 Tube	100,000	80,000
Plate to B plus	50 ohms	50 ohms
Suppressor Grid to Cathode	0	0
Suppressor Grid and Cathode to Ground	1,000	850
Filaments	0	0

4TH STAGE—75 TUBE

Central Grid to Ground	500,000	400,000
Cathode to Ground	5,500	4,500
Diode Plate to Ground	325,000	275,000
Diode Plate to Ground	325,000	275,000
Diode Plate to Diode Plate	50	45
Diode Plate to common between R6 and C3	25	22
Diode Plates to Cathode	300,000	275,000
Plate to B plus	100,000	80,000
Plate to all other Plates	100,000	80,000
Filaments	0	0

VOLTAGE CHART

(Test with Radio in operation 1000 ohms per volt meter)

B plus on terminal strip to B minus or ground on strip, 175V to 195V.

Chassis to Plate of No. 75 Tube, 125V to 140V.

Chassis to all other Plates, 175V to 195V.

Chassis to Cathode of No. 75 Tube, 1.7V to 2V.

Chassis to Cathodes of No. 78 Tubes, 5V to 6.5V.

Chassis to Cathode of No. 77 Tubes, 5V Min. 6.5V Max.

NOTE: If voltage runs as high as 7 to 9 volts there are shorted turns on cathode coil of oscillator.

Excessive voltage from 30 to 35V. indicates open circuit between Cathode of 77 Tube through Cathode coil, resistor R8 to No. 2 terminal on first I. F. Coil.

Chassis to all screen Grids, 60V to 75V.

NOBLITT SPARKS INDUSTRIES

MODEL Arvin 30-A
Condenser Data
Control Data

CAPACITY CHART

C4—To check this condenser a continuity test across the antenna section of the variable condenser should show no reading if both the variable condenser and the C4 are O. K. If one or the other is shorted the meter will show full scale deflection. If apparently shorted, check variable condenser by turning the plates in and out of mesh. If the variable condenser is at fault the meter will tend to flicker as the plates are rotated in and out of mesh.

C5—No check.

C6—Continuity check from common between R5 and R6 to ground should show no deflection on meter.

C7—Continuity check from control grid of No. 15 Tube to diode plate should show no deflection on meter.

C′—Using a capacity reading AC Voltmeter Millameter.

Check should show .25mfd.

C′—Using a capacity reading AC Voltmeter Milliameter Check should show .5 mfd.

C1—Coninuity check from cathode No. 75 Tube to ground should never show full scale deflection.

C2—Continuity check from cathode No. 78 Tube to ground should never show full scale deflection.

C3—Continuity check across this condenser should never show full scale deflection.

GENERAL CHART

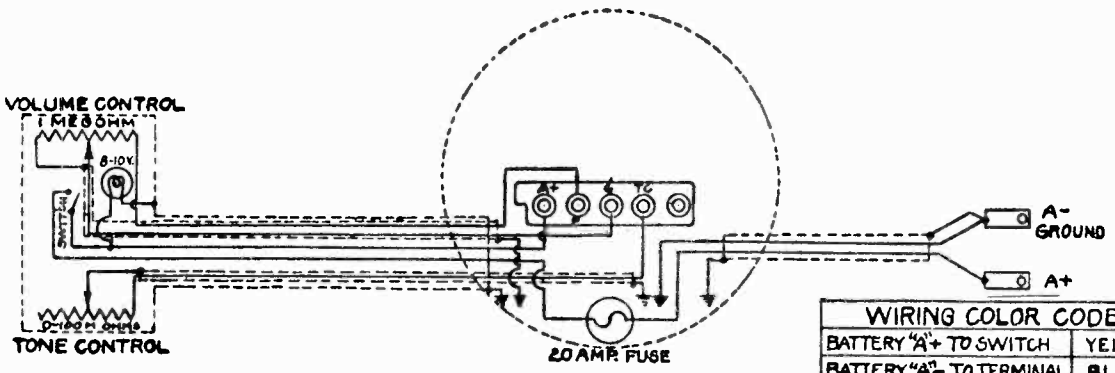
(ANTENNA COIL.)

To check a bad antenna coil, remove the control grid clip from the top of the first No. 78 Tube and touch the grid cap on the tube with the antenna wire lead.

If the radio plays after this is done—and did not before—it indicates an open circuit in the antenna coil.

(POWER PACK.)

To check quickly the power pack and remote control remove the grid clip from the control grid of the No. 75 Tube and touch the cap with your finger, if the volume and tone control are turned full on, a distinct roar will be heard in the speaker. A voltage check on the power pack should test 175V to 190V from BX to ground.



ARVIN CAR RADIO MODEL 30A
REMOTE CONTROL CIRCUIT DIAGRAM

WIRING COLOR CODE	
BATTERY "A"+ TO SWITCH	YELLOW
BATTERY "A"- TO TERMINAL	BLACK
"A"+ TERMINAL TO SWITCH	BLACK
"6" TO ROTATING CONTACT	GREEN
"P" TO VOLUME CONTROL	BLUE
SWITCH TO DIAL LAMP	RED
VOL. CONTROL TO GROUND	BRAIDED SHIELDING
TONE CONTROL TO GROUND	BRAIDED SHIELDING
TONE CONTROL TO TERMINAL	BROWN

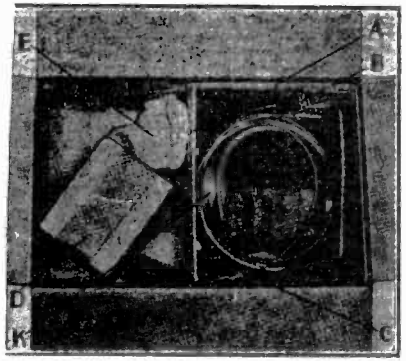


FIGURE 1.

You can play the Radio before taking it from the carton To do so, attach the antenna wire to any convenient aerial, and the battery cables to a 6-volt storage battery Lift remote control "D" from its carton, get key from muslin sack, turn on the current and tune it in.

FIGURE 2. (BELOW)

Here's how it looks when first taken from carton and spread out for examination. Now please examine its carefully and identify the parts by the following key letters:

"A"—Packing board (represents dash of car).

"B"—End of antenna lead

"C"—Remote control

"E"—Sack—containing

EF Generator condenser

EE Suppressors

ED Carriage bolt

EG Grounding ribbon

EC Felt Pad

EA Steering column strap

Strap screws

Straps

"F"—Hollow mounting studs.

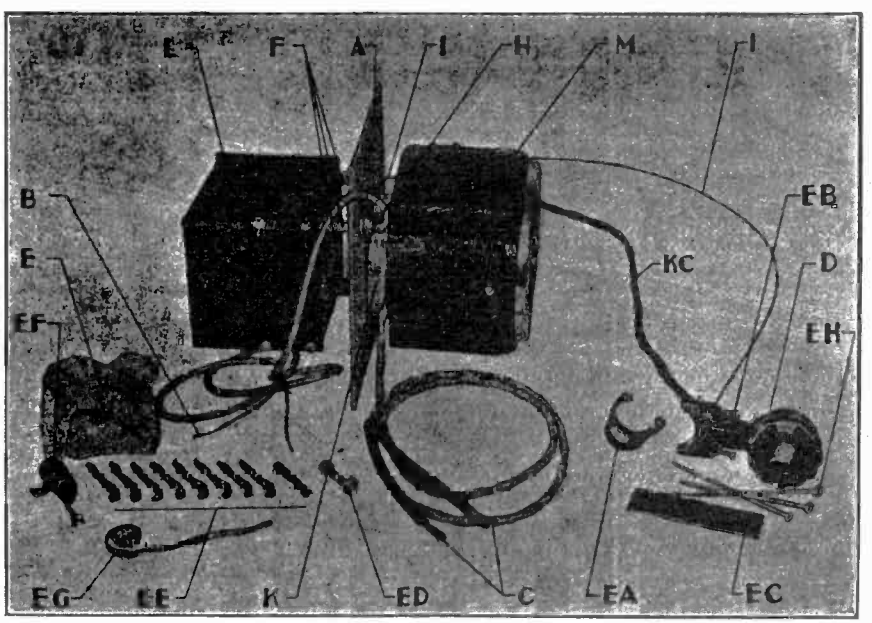


FIGURE 3.

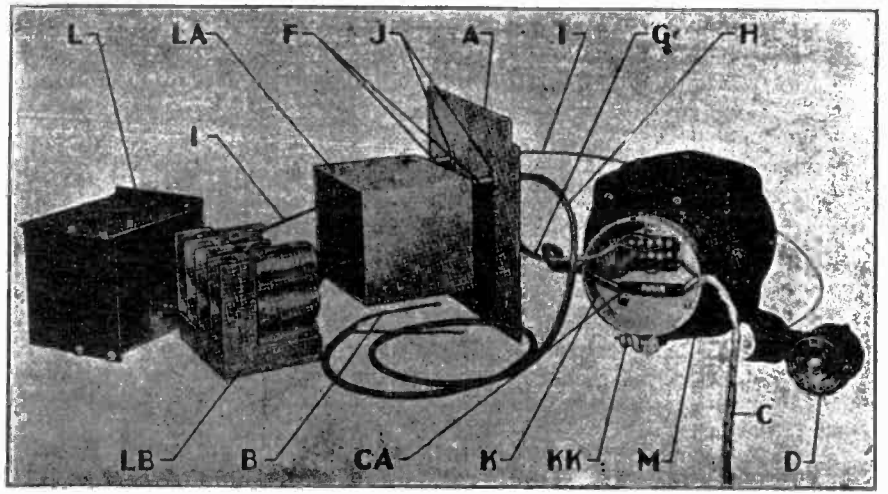


FIGURE 2.

Partly disassembled to show how various parts fit into and onto each other.

TO INSTALL.

FIRST—

Take a look at Figure 1-A. This will give you a general idea how your complete job will look. The remote control is shown, merely for convenience of illustration, standing upright from steering column. However, the dial is set for the remote control to be mounted in a horizontal position to the RIGHT of the steering column.

Examine carefully how the chassis and speaker units are mounted on the packing board "A" which represents the dash of your car. The square shaped part "L" goes on the engine side of the dash. The Speaker "M" will be on the passenger side of the dash. The Radio is attached to the dash by three hollow studs, "F". (You'll find a templet for making the dash.) The 1-inch hollow stud at the lower part of the Radio case interconnects the chassis and the speaker units by inter-set wires "G" which pass through it.

One hollow stud at the top conveys the antenna wire "B" into the Radio chassis through the shielded case "H" which is attached to the hollow stud with an adapter nut. The other hollow stud at the top carries the Control wire (Borden wire) "I" to the variable condenser.

Extra nuts "J" are used to draw the studs up snug. An outlet box (Fig. 2, 3, 4) is made of two units—"K" on back of speaker and "KA" on dash. When these are clamped together by a friction band they hold the speaker to the dash. (See Figures 3 and 4.)

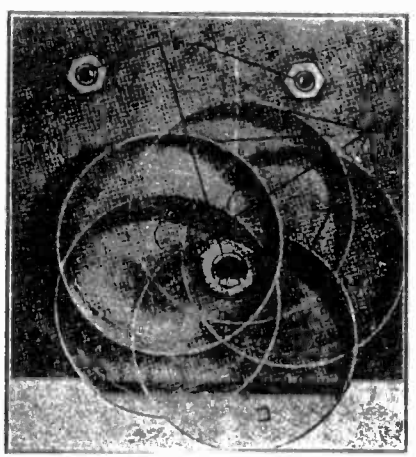


FIGURE 4.

Shows how outlet box KA can be located in various positions from 1" hollow stud.

Mechanical Description of Speaker Chassis Models 20A and 30A

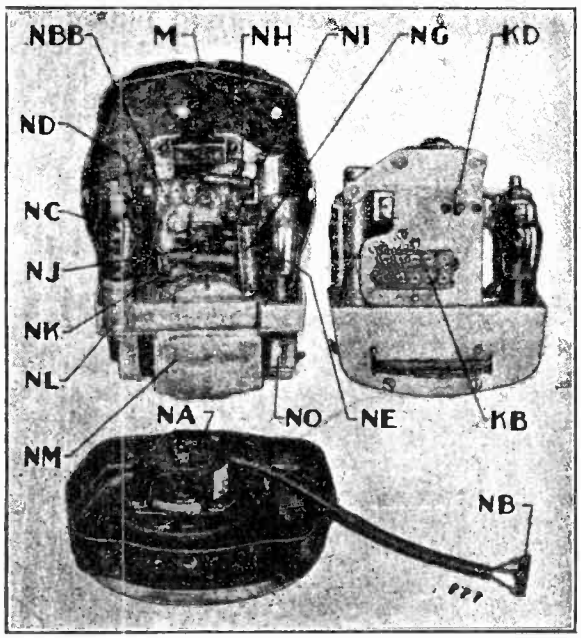


Figure 11

Figure 11 shows the speaker front removed, giving a clear indication of how the speaker is mounted. Its interconnecting cable shows the chassis proper loosened from can, a front and rear view.

Figure 12 shows the quarter view of either side of a No. 30A speaker chassis. Figure 12A shows quarter view of No. 20A speaker chassis.

Figure 13 shows speaker chassis laid on its back and the bottom coverplate disassembled so as to see into the bottom, indicating the location of the vibrator and how it is attached.

Figure 14, with step plate removed, and the location of power transformer, buffer condenser and RF choke indicated.

Following is the list and description:

NA—Speaker
6" used in Model 30A
5" used on Model 20A

NB—is terminal strip attached to NBB terminal strip on speaker chassis proper.

NC—is the 79 tube used only on Model 30A chassis.

ND—is 41 tube used on both 30A and 20A chasses.

NE—is 84 tube used on both 30A and 20A, a power rectifier tube.

NF—are filter condensers smoothing out AC waves as they come from power transformer for the high voltage "B" current.

NG—is RF by-pass condenser in the 6 volt circuit.

NH—is a condenser used only across the plates of the 79 tube and only on the 30A. It is used to reduce the high frequency response of the speaker.

NI—is a choke in the B circuit.

NJ—is a condenser.

NK—is an RF choke on the shunt side of the A or 6 volt circuit.

NL—a condenser cathode of the 41 tube.

NM—indicates the bottom plate power eliminator cover which houses the vibrator and power transformer assembly, having shelves on either side for attaching of load delay relay and audio transformer, held in place by two screws at rear of the chassis.

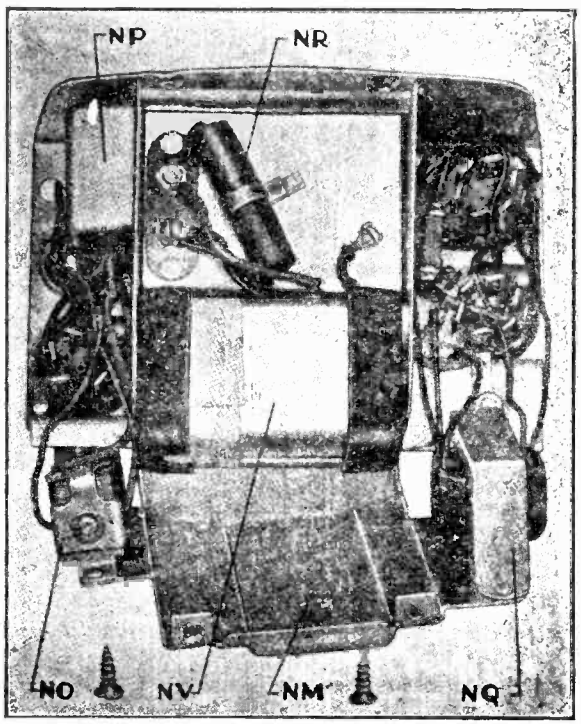


Figure 13

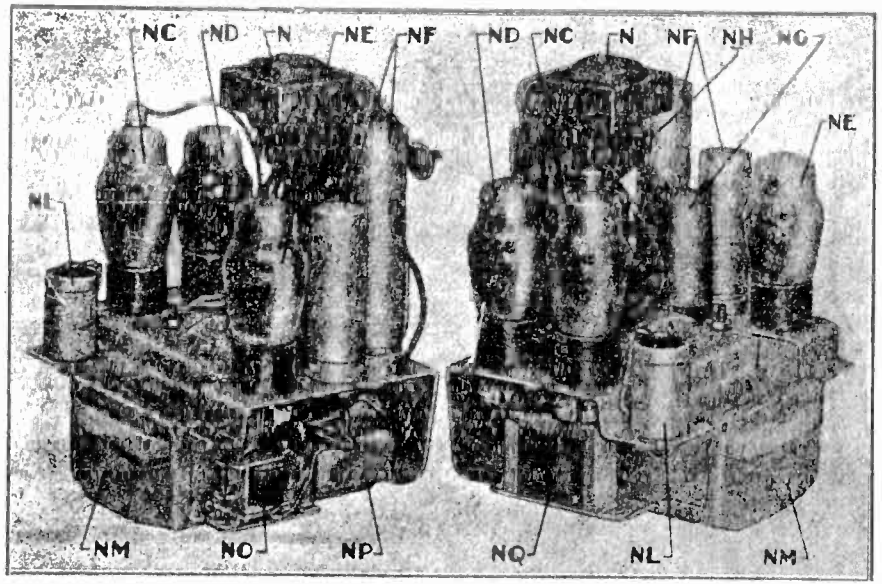
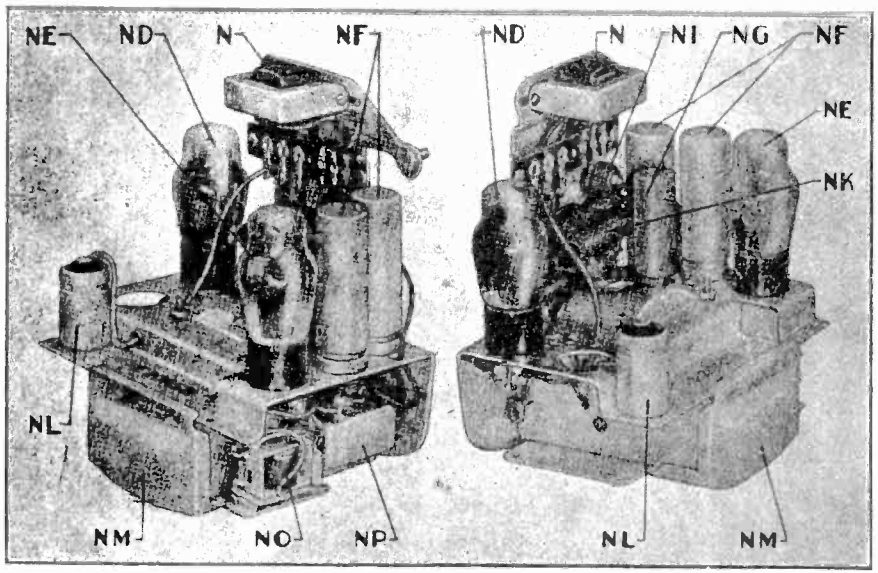


Figure 12 (above)

Figure 12-A (below)



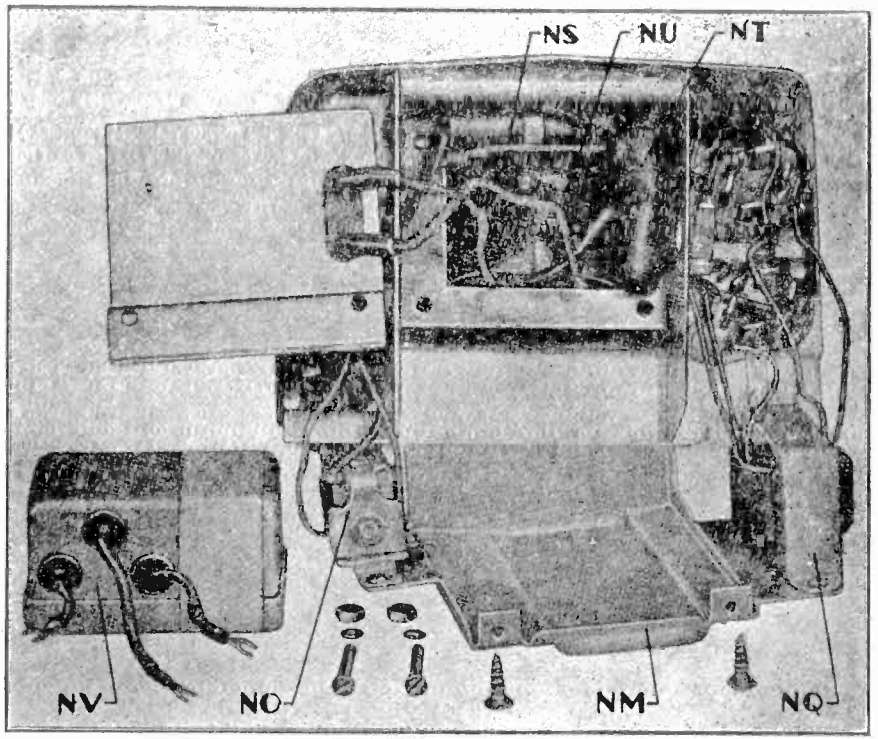


Figure 14

NO—is a relay and resistor mounted by its side which operates in combination to furnish load delay to dissipate the energy produced by the vibrator and power transformer until the tubes have heated so they can receive this power.

NP—by pass condenser on the center tap of the primary side of the power transformer.

NQ—audio transformer used only in the Model 30A.

NR—a twin condenser across the two hot 6 volt leads of the vibrator.

NS—buffer condenser on the B side of the power transformer.

NT—RF choke in the center tap of the primary of power transformer.

NU—is power transformer held in place by four screws, two of which hold step plate—and two of which hold upper part of the chassis carrying terminal strips.

NV—is vibrator equipped with three leads—one short or ground attached to step plate—the other two attached to two screws at the same point where the condenser NR is attached, which couples in the other two outside windings of the power transformer with the vibrator. The vibrator lead is supported by two rubber or felt pads.

The above description, together with outlines indicated in circuit wiring diagrams will more than serve to show you how the wiring is arranged in the chassis.

The following Bulletins are obtainable upon application:

Bulletin No. 1—Installation Instructions.

Bulletin No. 2—Motor Noise Interference Elimination Procedude.

Bulletin No. 3—Mechanical Description of Radio Chassis.

Bulletin No. 5—Wiring Diagram and Electrical Measurement and Trouble Shooting.

ARVIN CAR RADIO

MOTOR NOISE ELIMINATION PROCEDURE

STANDARD SUPPRESSION

Standard suppression consists of the following parts: six spark plug suppressors for six cyclinder cars or eight spark plug suppressors for eight-cylinder cars, one secondary coil suppressor, and the generator condenser to be grounded with the lug on the side of the condenser can on the frame of the generator, and the wire lead is to be fastened to the hot side of the relay which in most cases is mounted above or on the side of the generator.

These parts along with a piece of tinned copper ribbon, are supplied as standard equipment with the Radio when purchased. The copper ribbon is to be used to ground the passenger compartment through the motor bulkhead into the engine compartment —suc has gas lines, chokes, free wheeling controls, Borden wires, and all other tubing and wiring shielding such as electro-lock tubing, that pace through this bulkhead.

On most cars this standard suppression will be all that is necessary to completely eliminate motor noise in the Radio.

Special Instructions For Elimination of Motor Noise Not Removed by Standard Suppression.

After you install the Radio receiver refer to the tabulated data on suppression of motor noise interference on the particular make car in which the Radio is installed. By reading down the column beneath the "year", "serial number" or "model car", you will find certain grounds that are recommended to be made on the chassis and certain changes in the electrical connections or wiring. In most cases these recommendations will be all that are necessary to complete a perfect job.

Additional Information On Individual Makes of Cars.

AUBURN

Shield the high tension lead from coil to distributor and ground the shielding to the motor and to the frame of the distributor. Install generator condenser at ammeter and ground to the dash. On Auburns that do not have a factory equipped antenna, shield the lead in as mentioned in Special Antenna Installation Bulletin. On cars equipped with antenna at factory, push a piece of braided shielding loom over the antenna lead up into the roof structure as far as possible without grounding this loom on the antenna itself.

BUICK

Ground spark plug cover case with big tail leads to water pump nut at front of the motor and oil lines at rear end of motor. Splice one piece of large loom over all wires leading from distributor to the spark plug cover and ground this shield at cover. Solder the shielding firmly in place and make certoin that it does not come close enough to the distributor that there will be any possibility of sparks jumping over, shorting out the distributor. In some extreme cases on old model Buicks it has been found necessary to entirely shield the distributor head by taking a piece of copper screen wire approximately 4" wide by 12" or 15" long and wrapping it around and over the top of the distributor and around, between, and over the shielded lead from the coil ond the wire to the spark plugs.

Solder this screen wire in place to the shielding in both cases and tack all the ends and edges down with solder so that it remains firmly in place. In doing this make sure that you do not short the screen out on the hot wire from the battery which connects to the base of the distributor or to the adjusting screw on the back of the distributor head. Also keep this screen as far as possible away from the suppressor which you place in the top of the distributor to prevent shorting out this wire on the suppressor. Disconnect the dome light wire. Install dome light switch at the left-hand side of the dash, In extreme cases it may be found necessary to also shield the dome light wire throughout its entire length, grounding the shielding at both ends to some metal part of the car. Bond the metal mounting screws which hold the panel above the windshield in place and carry the ground lead clear to the dash of the car if necessary. Install a suppressor at the distributor and in some cases it is also necessary to install a suppressor at the coil itself in addition to the one on the distributor. It is not necessary to install suppressors at the spark plugs because the spark plug housing is grounded and effectively shields the plugs.

CHEVROLET

1930 to 1932 Inclusive

It is necessary in all Chevrolet cars to install antenna. Refer to aerial installation instructions. Carry shielding down the right hand door post and ground at the dash, as well as at the roof. The dome light wire should be disconnected and shielded up into the door post as far as possible and a dome light switch installed at the dash. This and standard suppression are generally all that are necessary.

However, in some extreme cases it is necessary to shield the high tension ignition lead from the coil to distributor, making sure that the shielding does not come close enough at either end to arc over and short out the distributor. And in some cases it is also necessary to run a separate primary lead from the switch to the distributor and shield this lead. Remove the old primary wire from the switch to the coil entirely. The three wires that run down through the loom should be removed and run through separate shielded cables. This will be found necessary only in a car that has had quite a lot of use and ignition wires are badly worn. It will sometimes help if the primary leads to the ignition coil are reversed and the two are twisted together as they come from the dash to the coil.

CHEVROLET—1933

In the 1933 Chevrolet the antenna is already installed and it is necessary to shield the lead-in from the antenna up the door post as far as possible by pushing a piece of metallic loom over the antenna lead already installed in the car. Connect the antenna lead of the Radio set to the antenna wire of the car. Tape the joint, then slide metallic shielding over this joint where the loom enters the door post, pig-tails should be attached and grounded to the dash of the car. A dome light switch should be installed and the dome light wire shielded as far up the door post as possible in all models equipped with the dome light switch either on the door post or at the roof.

On all General Motors cars in which a difficulty is encountered in removing motor noise, that difficulty may be overcome by proceeding to shield the distributor head as mentioned under BUICK in the preceding paragraph. This is not recommended, however, except as a last resort.

FORDS—Models A and B

First, see instructions for installation of antenna in any automobile. The Ford chicken wire is generally grounded all the way around and also to the center steel ribs which support the top cover. The chicken wire should be cut away from all metal parts in order that it will not be grounded and may then be used as an antenna or an extra copper screen wire installed for antenna.

The armored cable which carries the primary wire from the switch to the distributor should be grounded at the metal bulkhead and the spark control rod should be grounded to the motor block. It is not generally necessary, except in extreme cases, to shield the wire leading from the distributor to the coil. It will sometimes be found necessary to install an extra switch for the dome light and to shield the dome light wires up into the body as far as possible.

FORD—Model V-8.

On the Ford V-8 it is impossible to use a distributor suppressor so that standard suppression is not possible. It is therefore necessary to build up the rotor contacts in the distributor head so that they clear the rotor approximately .002 to .003 inch. This is best done by soldering a small bit of solder to each point of the rotor on either side, then filing down each point until they just clear. The primary wire running in the conduit that carries the high tension spark plug wire should be taken out of this conduit and shielded from the distributor through the dash. The dome light wire should also be disconnected and shielded up into the door post. The antenna lead in should be brought down the left hand door post. In most cases the dome light wire goes down the right hand door post and in that way there will be no interference between these two leads.

FRANKLIN 1930-31-32

Remove boot covering distributor and cut about six inches of conduit off which carries high tension ignition wires to plug.

This makes possible the installation of a suppressor at the distributor. Peen out the rotor arm so that clearance between the rotor and contacts is .003".

Ground conduit carrying ignition wires to bulkhead on the motor side of the dash and ground coil frame to the oil line in driver's compartment.

Shield secondary lead from coil to dash and ground at dash. Cut the dome light wire and install switch at dash, close to the door post up which the wire passes. Shield the antenna lead up the right hand door post and bond to the dash.

LA SALLE
the Same as for Chevrolet

LINCOLN—All Models

In the Lincoln motor car there are two ignition coils which are mounted in the driver's compartment on the dash. The high tension leads pass through the dash into metal conduits to the distributor which is located on the motor. The leads from the coil should be well shielded and bonded to the bulkhead. A filter network is generally necessary for the dome light wire because of the complex wiring. This usually consists of a choke in series with each of the leads, by passed by condensers to ground. These chokes can be made by winding about thirty turns of No. 18 wire on a wood dowel, just about the size of a lead pencil, and are about as effective as any manufactured choke. The condenser to be used should be approximately ½ to 1 mfd. capacity and of the common paper insulated type.

MARMON
All Models Except 16 Cyl.

If the antenna is not already installed it will be necessary to install it, following the general antenna installation procedure.

Bring the lead in down the left hand door post and the dome light switch should be installed at the dash. Standard interference suppression will generally suffice for all installations with the exception that it is necessary to reduce the rotor clearance to about .002 to .003 inch.

OAKLAND
Same as for Chevrolet

OLDSMOBILE
Same as for Chevrolet

PLYMOUTH
1931 and '32 Models

Standard suppression should be followed. The distributor clearance should be reduced to .003 inch. The coil lead from the coil mounted on the dash should be shielded to the metal bulkhead and thne grounded to the oil line. The oil line should be grounded on the motor side of the dash to the metal bulkhead. The primary lead which goes from the coil to the distributor should be wrapped around this shielding about three times and reconnected. Occasionally it is necessary to install a generator condenser at the coil on the battery side to ground. The dome light switch should be installed as close to the left hand side of the dash as possible. The pigtail on the end of the antenna shield should be grounded to the dash on the right side. The antenna shield should be shoved as far up the door post as it will reach.

This procedure applies to DODGE, CHRYSLER and DE SOTO.

PONTIAC - 6
Same as for Chevrolet

PONTIAC 8 — 1933

Shield the high tension lead from coil to distributor to the end of conduit, carrying ignition wires in motor compartment.

Shield and twist, after shielding primary and secondary wire to the coil, and continue shield through the dash to distributor, and ground to screws holding ignition cover to the side of the motor block. Ground the generator and radiator shell with pigtails to same point.

The Radio may be connected to the starter and ground lug to the steering column. Shield the lead in from the antenna up the right hand door post. Install dome light switch just to the right of the oil gauge. Ground aerial pigtail at right hand door post on the bolt in the lower right hand corner of instrument panel.

STUDEBAKER

Reduce the clearance between rotor and distributor coils. Shield high tension leads from coil to distributor. Ground pigtail on the end of the antenna cable to the instrument panel where antenna cable enters the door post.

ROCKNE

It is necessary on the Rockne automobile to reduce the spark gap between the distributor and rotor and to install a shielded cable between the coil and the distributor. Ground metal shielding to the oil line. Ground oil line on the motor side of the bulkhead. The dome light wire should be disconnected and a switch installed and the wire shielded from the switch to the cowl and up into the door post as far as possible. The bare antenna lead under no circumstances is to be brought down and under the cowl and exposed at any point. The shielding should be pushed up as far as possible into the door post.

Miscellaneous General Information Relative to Removing Motor Noise.

When primary wires to the coil run through the same conduit as the secondary or spark plug wire run—remove this wire from the conduit and shield it if necessary, grounding the shielding at both ends to some part of the motor block or the bulkhead between the passenger's compartment and the motor.

Also, be sure when shielding the secondary lead from the coil to the distributor to ground both ends of this shield, either to the motor or to the bulkhead. On some few cars the hood over the engine appears to be ungrounded or at least is a very high resistance ground and should be grounded with pigtails of shielding cable soldered to both sides of the hood and also to the motor bulkhead or motor block.

On cars equipped with co-incidental lock on the steering post an extra generator condenser should be installed from one switch terminal to ground. The exact terminal on which to install this condenser can be determined only by experiment. The condenser body should be grounded to the dash or to the motor bulkhead. On some Ford V-8's it is necessary to install an extra generator condenser on the generator to the other terminal of the cut-out relay, thus making two condensers on the same relay—one on each terminal to ground.

On some Chevrolets, generally of the older models, it is necessary to install an extra condenser from the primary of the ignition coil to ground. The exact terminal to connect this condenser to can only be determined by experiment. Be sure that the grounding of this condenser is solid, preferably to the motor block or to the motor bulkhead.

On all cars equipped with "Electrolock" it may be found necessary to remove the primary return wire from the switch to the coil and replace it with a new wire run through a piece of shielding loom grounded near the switch and also to the metal bulkhead on the motor side of the dash. This lead should be brought out through the dash as far as possible from the rest of the electrical wiring of the car.

It may be pointed out that loose connections anywhere in the electrical circuit of the car will cause motor noise or what appears to be motor noise. If this condition exists it is wise to check the entire electrical circuit of the car and make sure that all connections are tight before trying any other extreme methods of motor noise elimination.

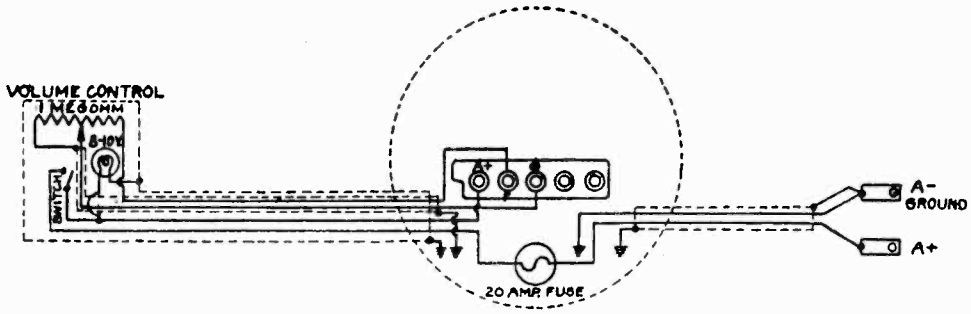
For information on cars not listed, refer to tabulated data which includes practically all makes of cars.

From time to time, as experimental work progresses, additional bulletins will be issued to supplement this information already given, and may be obtained upon application to Noblitt-Sparks Industries, Inc., Columbus, Indiana.

Noblitt-Sparks Industries Inc.,
Columbus, Indiana

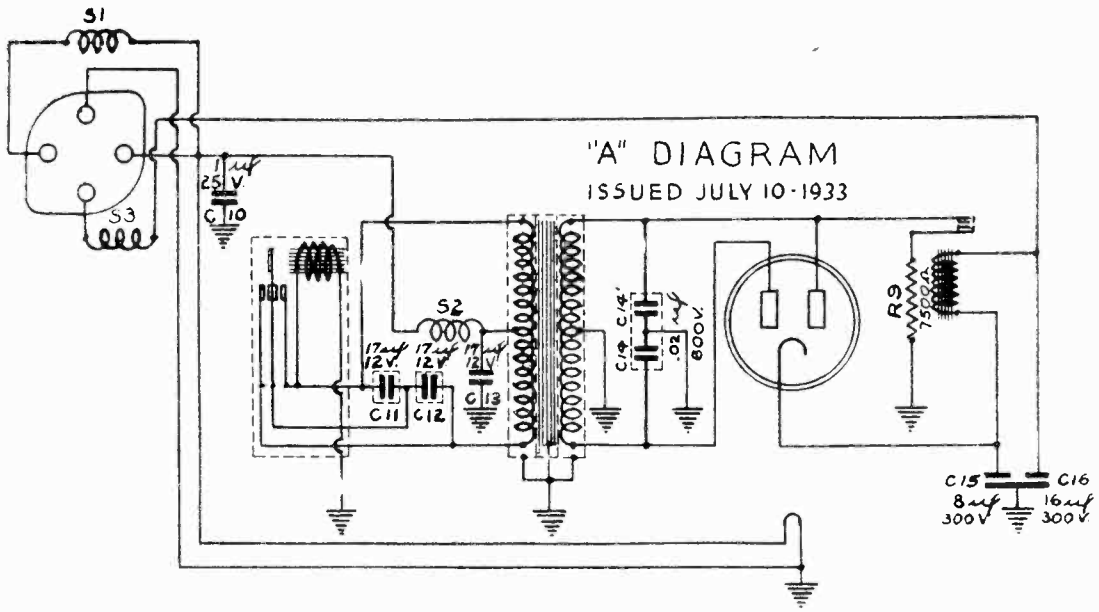
NOBLITT SPARKS INDUSTRIES

MODEL Arvin 10-A
B Supply Schem.
MODEL Arvin 20-A
Control Schem.



ARVIN CAR RADIO MODEL 20A
REMOTE CONTROL CIRCUIT DIAGRAM

WIRING COLOR CODE	
BATTERY "A"+ TO SWITCH	YELLOW
BATTERY "A"- TO TERMINAL	BLACK
"A"+ TERMINAL TO SWITCH	BLACK
"G" TO ROTATING CONTACT	GREEN
"P" TO VOLUME CONTROL	BLUE
SWITCH TO DIAL LAMP	RED
VOL. CONTROL TO GROUND	BRAIDED SHIELDING



ARVIN CAR RADIO MODEL 10A
"B" POWER SUPPLY

CAPACITY VALUES			RESISTANCE VALUES		
SIGN	mf	P.V.DC	SIGN	Ω	WATTS
C10	1	10	R9	7500	1
C11	17	12			
C12	17	12	CHOKE SPEC.		
C13	17	12	SIGN	TURNS	GAUGE
C14	02	200	S1	100	#16
C14'	02	200	S2	100	#16
C15	8	300	S3	750	#29
C16	16	300			

CHASSIS WIRING COLOR CODE	
CATHODE & GROUND	YELLOW
PLATES	BLUE
"B" POSITIVE	RED
HEATERS	BLACK
POWER TRANS. PRIM. MID-TAP	BLACK
POWER TRANS. PRIM. END-TAP	BLUE WITH RED TRACER

MODEL 20-B
Schematic

NOBLITT SPARKS INDUSTRIES