RCA VICTOR

"HIS MASTER'S VOICE"

MODELS VRA101M & VRA101C

Ten-Tube, Three-Band, A.M.-F.M. Superheterodyne

TECHNICAL INFORMATION AND SERVICE DATA

1947 No. 15

GENERAL SERVICE DIVISION • RCA VICTOR COMPANY LTD.

Model VRA101C

Model VRA101M

Electrical and Mechanical Specifications

FREQUENCY RANGE

Standard Broadcast S.B.	540-1600 K.C.
Short Wave 31 - 25 - 19 M.	9.4-15.8 M.C.
Frequency Modulation	88-108 M.C.
Intermediate Frequency A.M.	455 K.C.
Intermediate Frequency F.M.	10.7 M.C.
Tuning Drive Ratio	20 to 1

RADIOTRON COMPLEMENT

(1) Type 6BA6	R.F. Amplifier
(2) Type 6BE6	Converter
(3) Type 6BA6	1st I.F. (FM & AM)
(4) Type 6BA6	2nd I.F. (FM only)
(5) Type 6AL5	F.M. Ratio Detector
(6) Type 6AT6	A.M. Det., A.V.C. & 1st A.F.
(7) Type 6AT6	Phase Inverter
(8) Type 6V6GT/G	Power Output
(9) Type 6V6GT/G	Power Output
(10) Type 5Y3GT/G	Rectifier
Pilot Lamps (2)	Mazda No. 51 6-8 volts 0.2 amp.
(1)	Mazda No. 47 6-8 volts 0.15 amp.

POWER OUTPUT

Undistorted	4.5 Watts
Maximum	7.0 Watts

LOUDSPEAKER

Type	12 inch P.M.
Voice Coil impedance	2.2 ohms at 400 cycles

CABINET DIMENSIONS (Inches)

	Height	Width	Depth
Model VRA101M	33½	37	17
Model VRA101C	36¾	37¾	17¾

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycle, 105 watts
Rating B	105-125 volts, 25 cycle, 105 watts

PHONOGRAPH

Type	Automatic
Record Capacity	Fourteen 10-inch or Twelve 12-inch
Turntable Speed	78 r.p.m.

PICKUP

Type	Crystal
Impedance	100,000 ohms at 1,000 cycles
Average Output	1.4 volts at 400 cycles across 500,000 ohm load

GENERAL DESCRIPTION

The RCA Victor Models VRA101M and VRA101C AM-FM radio-phonograph combinations are housed in cabinets of striking beauty. The AM-FM receiver is a ten tube, three band superheterodyne using the most up-to-date circuits for high quality radio reproduction. Features of the design include: Built-in folded dipole antenna for F.M. reception; Built-in short wave antenna; Adjustable standard broadcast loop antenna. Miniature tubes for improved high frequency performance; R.F. stage; Iron core R.F.; Oscillator and I.F. coils; "Amplitude Ignorer" for improved rejection of AM when receiving F.M.; Ratio detector for high quality F.M. reproduction; Automatic volume control circuits; Full range variable tone control; Tone compensated volume control; Push-pull pentode output stage; Twelve inch P.M. loudspeaker. Models VRA101M and VRA101C use type 960001-4 automatic record changer mechanism with high fidelity, low noise crystal pickup. Refer to the 960001-4 Service Note for adjustment details and list of replacement parts for this mechanism.

A COMPARISON OF F.M. AND A.M.

A conventional A.M. receiver operates with a signal in which the intelligence is transmitted by means of amplitude variations while the frequency remains fixed. An F.M. receiver, however, operates with a signal in which the intelligence is transmitted by means of frequency variations while the amplitude remains fixed. Noise, which consists largely of amplitude variations passes readily through an A.M. receiver which responds to these variations. In an F.M. receiver, special circuits are provided to minimize the response to amplitude variations so that noise free reception is assured with all except very weak signals. Where the signals picked up by the built-in folded dipole antenna are too weak, an outside F.M. antenna is necessary.

Due to the very high frequencies used for F.M. (88 to 108 megacycles) certain differences may be noticed in this type of reception. It is known that in some locations, particularly urban areas, a type of distortion peculiar to F.M. may be experienced. This is in no way a fault of the receiver but rather a physical phenomena caused by the signal being reflected from some object resulting in two or more paths for the transmitted signal. The reflected signal, arriving late and out of phase, tends to amplitude modulate the F.M. signal. This distortion may appear as a strange buzz, rattle or swish. It may even give the effect of an overloaded audio stage. In other cases an increase in noise level may be noticed. Choosing a different location for the receiver may eliminate the trouble since the directive folded dipole antenna housed in the cabinet will be oriented differently. In severe cases, an outside dipole and reflector pointing in the right direction may correct the trouble.

CIRCUIT ARRANGEMENT

The circuit for A.M. reception uses an untuned R.F. stage in which the loop antenna is used as the first tuned circuit. This is followed by a converter stage. The incorporation of temperature compensating capacitors in the tuned circuits greatly reduces the oscillator drift.

Primaries and secondaries of the 455 kc. A.M. and 10.7 mc; F.M. I.F. transformers are connected in series in the plate and grid circuits of the I.F. amplifier stages, except for the secondaries of the second I.F. transformers which are connected to the A.M. detector and F.M. driver amplifier respectively. The F.M. driver is followed by a ratio detector. The 10.7 mc I.F. transformers have relatively little effect on the 455 kc. A.M. I.F. signals due to low inductance of their coils and the I.F. amplifier operates in the conventional manner.

A double diode triode acts as A.M. detector, A.V.C. and first audio amplifier and, with a phase inverter, drives the push-pull pentode output stage.

The circuit for F.M. reception uses a tuned R.F. stage designed to match a 300 ohm antenna. This is followed by a converter stage. Temperature compensating capacitors and other precautions have been taken to make the oscillator as stable as possible consistent with the frequency at which it operates. All high frequency circuit connections are critical as to length and care must be taken that these lengths are maintained when any repair work is done.

As previously explained, the F.M. and A.M. I.F. transformers are connected in series. The 455 kc I.F. transformers have relatively little effect on the 10.7 mc. F.M. I.F. signals due to the low reactance of the capacitors in the 455 kc transformers, so that the two stage amplifier operates in the conventional manner. In the first I.F. stage an unbypassed cathode resistor is used to compensate for the variation in input capacity of the tube with a change in A.V.C. voltage. The second I.F. amplifier stage incorporates an "amplitude ignorer" circuit which provides noise suppression additional to that obtained in the ratio detector.

The ratio detector, appearing in RCA post-war f-m receivers, is a new device for converting a frequency modulated carrier to an audio signal, while at the same time offering a high degree of attenuation to any incident amplitude modulation. The relative insensitivity to amplitude variations, which is an inherent characteristic of ratio detectors, enables them to be used without the usual preceding limiter stage, thus affording the use of a high gain i-f stage instead of the low-gain limiter.

The ratio detector is discussed in detail on page 5. The audio amplifier is the same one used for A.M. reception and uses the triode section of the double diode triode as the first A.F. amplifier, with a phase inverter and push-pull pentode output stage.

ANTENNAS

If reception is not satisfactory on one or more of the three bands, using the built-in cabinet antennas, an external antenna may be used. (A 1000 ohm resistor is connected from terminal 1 to terminal 5 so that the F.M. antenna will also act as a short wave antenna.)

An external antenna for broadcast and short wave reception, when required, is connected to terminal 6.

If an external F.M. antenna is to be used, disconnect the internal folded dipole antenna and connect in its place the leads from the external antenna.

Two general types of F.M. antennas are used. These are the folded dipole and the folded dipole with reflector, both of which are used with a 300 ohm transmission line. The reflector element used is somewhat longer than the folded dipole element. These antennas are directive and must be oriented for maximum signal pickup from the desired stations. The folded dipole picks up a maximum signal from stations at right angles to the direction in which the dipole is pointing. The folded dipole with reflector is similarly directive but provides additional signal pickup from the side of the folded dipole away from the reflector and rejects signals from the reflector side of the folded dipole.

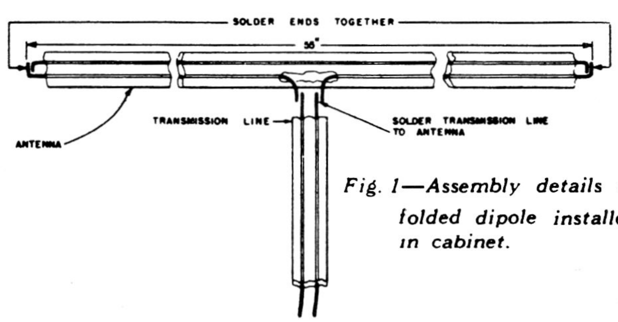


Fig. 1—Assembly details of folded dipole installed in cabinet.

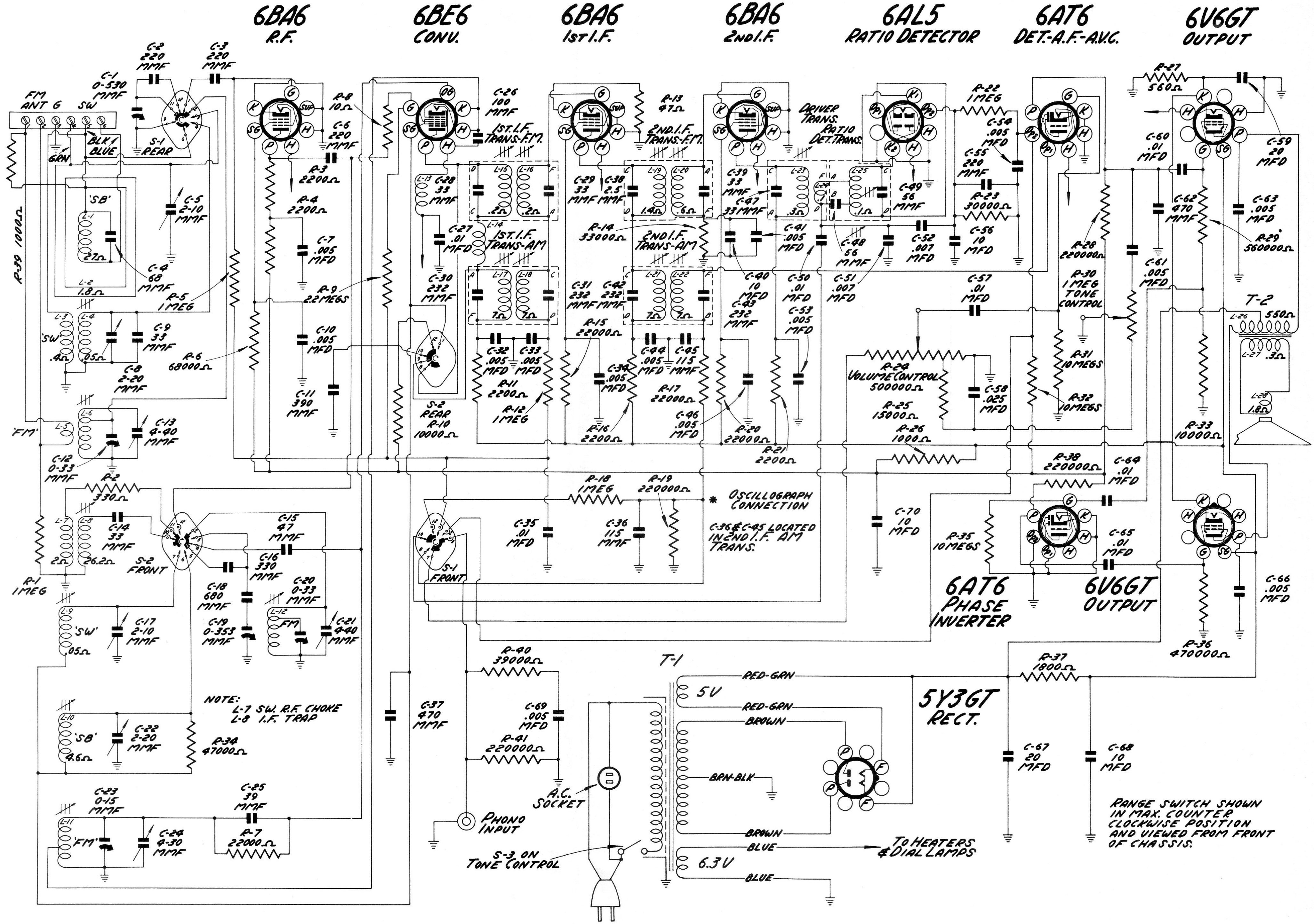


Fig. 2—Schematic Diagram—Range Switch shown in Phono Position.

THE RATIO DETECTOR

A schematic of the fundamental ratio detector is shown in Figure 3. C7 and C4 have very little reactance at the intermediate frequency, so it is evident that the parallel resonant circuit L_2 C_2 is the true load for the driver stage, this stage being shunt fed. A driver stage, in this case is nothing more than a conventional I.F. amplifier preceding the ratio detector.

The A.C. voltage applied to each diode is the vector sum of E_1 and the voltage across that half of L_1 which is connected to the diode plate, as shown in the diagrams of Figure 5. E_1 has practically the same amplitude and phase as the voltage across the tank in the driver plate circuit. Since the primary (L_2) of the ratio detector transformer is inductively coupled to the secondary (L_1), the current in L_2 induces a voltage in L_1 and causes a circulating current to flow in L_1 and C_1. E_2 and E_3 are the voltage drops which occur across each half of L_1 as a result of this circulating current. When the carrier frequency is equal to the frequency at which the ratio detector transformer is tuned (Fig. 5A), the AC voltage applied to diode 1 equals that applied to diode 2. When the carrier frequency increases during a half cycle of modulation, the phase relations between E_1, E_2 and E_3 change in accordance with Figure 5B, and it is evident that the vector sum of the voltages applied to diode 2 exceeds the vector sum of the voltages applied to diode 1. When the carrier frequency decreases during a half cycle of modulation, the phase relations between E_1, E_2 and E_3 change in accordance with Figure 5C, and the vector sum of the voltages applied to diode 1 exceeds the vector sum of the voltages applied to diode 2.

A comparison with conventional discriminator circuits will show that as far as the AC voltages applied to the diodes are concerned, these circuits are almost exactly similar. Here the similarity ends, because the ratio detector method of extracting intelligence from the FM carrier differs greatly from previously used methods. Diode 1, R3, and diode 2 complete a series circuit fed by the AC voltage across L_1. Since the two diodes are in series, they will conduct on the same half cycle, and the rectified current through R_3 will cause a negative potential to appear at the plate of diode 1. The time constant of R_3C_6 is usually about 0.2 second, so that the negative potential at the plate of diode 1 will remain constant even at the lowest audio frequencies to be reproduced.

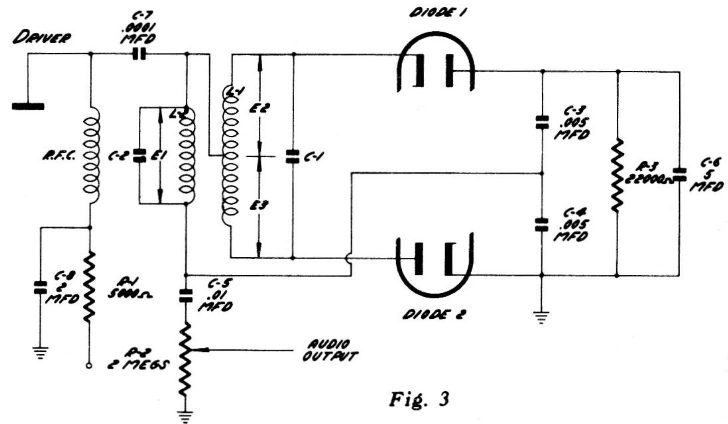


Fig. 3

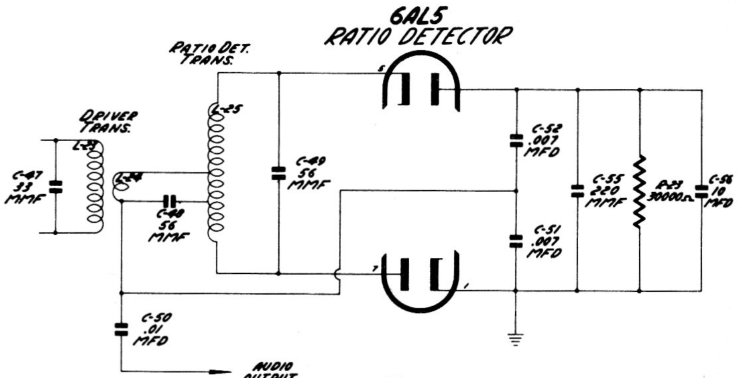
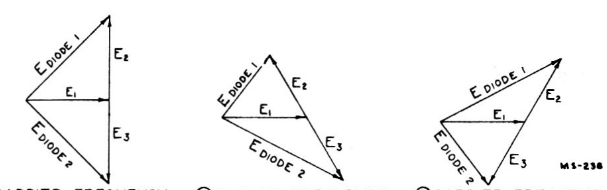


Fig. 4



Ⓐ CARRIER FREQUENCY AT I-F Ⓑ CARRIER FREQUENCY ABOVE I-F Ⓒ CARRIER FREQUENCY BELOW I-F

Fig. 5

C3 will be charged by the rectified current through diode 1 to a voltage proportional to the voltage represented by vector Ediode 1 (Figure 5), and C4 will be charged through diode 2 in proportion to the vector Ediode 2. Since the magnitudes of these vectors differ according to the instantaneous frequency of the carrier, the voltages across C3 and C4 will differ proportionately, the voltage across C3 being the larger of the two voltages at carrier frequencies below the i-f, and the smaller at frequencies above the i-f.

Note that the voltages across C3 and C4 are additive and that their sum is fixed by the constant potential across R3. Therefore, while the ratio of these voltages will vary at an audio rate, their sum will always be constant and equal to the voltage across R3. The potential at the junction of C3 and C4 will vary at an audio rate when an f-m carrier is applied to the detector, hence the audio voltage is extracted at this point and fed into the audio amplifier.

There is no direct d-c return path across either C3 or C4; the reason for this is twofold. Firstly, a direct return path is not needed because whenever the potential of the junction of C3 and C4 is raised or lowered in accordance with the frequency of the voltage applied to the detector, there will be a point on R3 having a potential equal to the voltage across C4. This point will shift up and down on R3 in synchronism with the audio voltage across C4. If this point could be connected to the junction of C3 and C4, a d-c return for each diode would be provided, but no current would flow through the connection because there would be no difference of potential between the point on R3 and the junction of C3 and C4. Since no current would flow through this connection, a direct return path would be useless.

Secondly, a peculiar form of distortion, apparent at low carrier levels; is evident if a resistance is connected directly across C4. This distortion is caused by C4 discharging through the resistance whenever the carrier level falls below the level at which the diodes are biased off by the voltage across R3. The effect of the distortion is to add a long peak to one loop of the audio cycle.

The rejection of amplitude modulation in the ratio detector may be explained as follows: A rapid increase in the amplitude of the carrier applied to the ratio detector will tend to increase the d-c voltages across C3 and C4. The sum of these voltages must always be equal to the voltage across C6. The voltage across C6 cannot change with a rapid increase in the amplitude of the carrier, due to the large time constant of R3 and C6. Therefore, this constant potential across C6 prevents the voltages across C3 and C4 from rising with an increase in the strength of the carrier. A reduction in carrier amplitude is prevented from appearing as a reduction in the voltages across C4 in the same way. The constant voltage across C6 can be considered to be a stabilizing voltage; i.e., it stabilizes the ratio detector output against amplitude modulation of the applied carrier.

The time constant of R3 C6 is not too large to prevent average changes in carrier level from appearing as changes in voltage across R3; in other words the voltage across R3 is proportional to the average strength of the received carrier. Thus this voltage serves as an excellent AVC voltage.

There is no "threshold" effect apparent in the ratio detector; i.e., there is no minimum carrier level which must be applied to the detector to cause noise attenuation as in other types of f-m detectors requiring the use of a limiter stage.

The Ratio Detector used in this receiver, differing only in the method of applying i-f energy to L1 and C1, is shown in Figure 4. This circuit, as well as any other ratio detector circuit, can be broken down and analyzed in almost the same manner as was the basic ratio detector circuit of Figure 3.

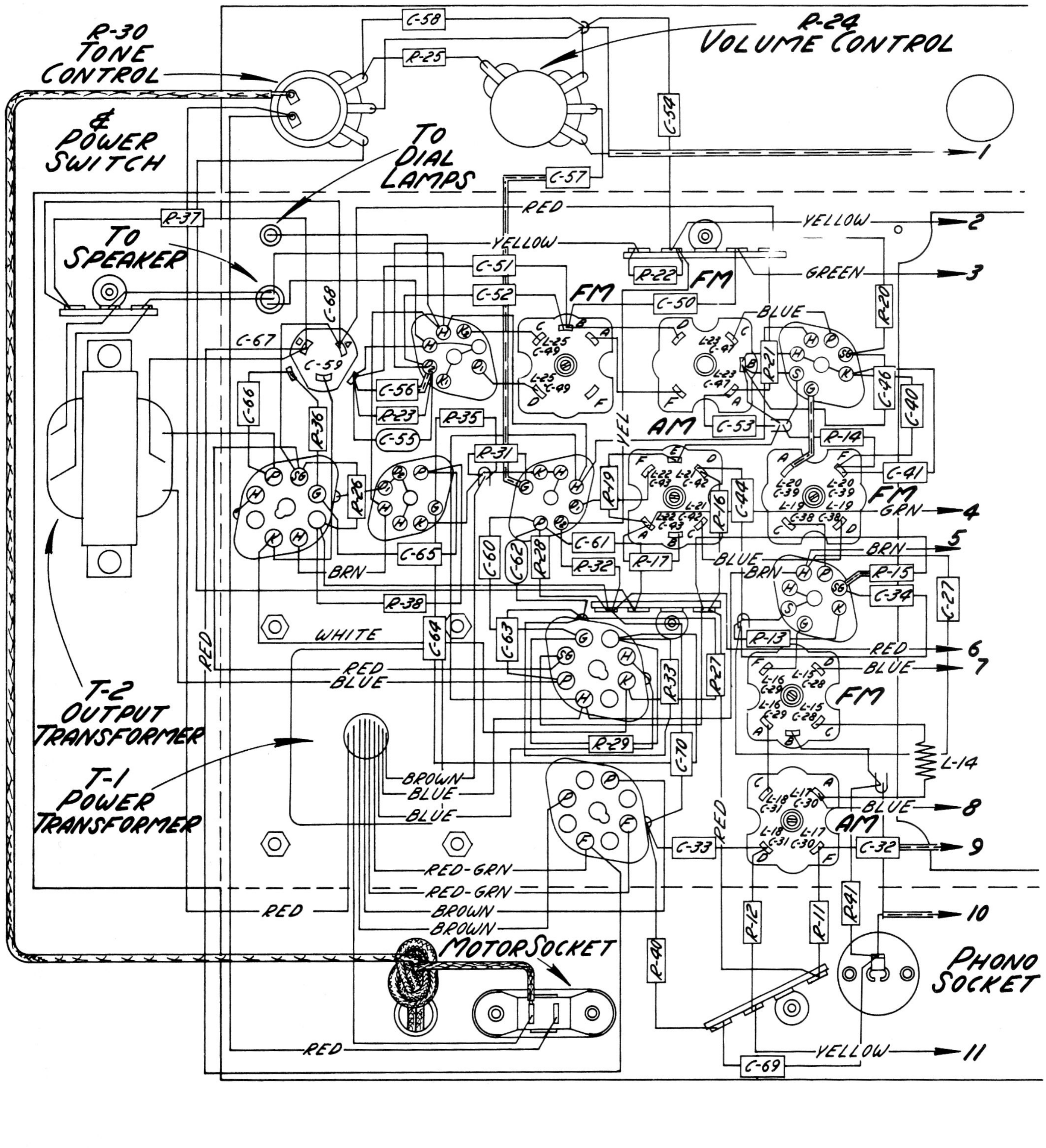


Fig. 6—Wiring Diagram of Main Chassis.

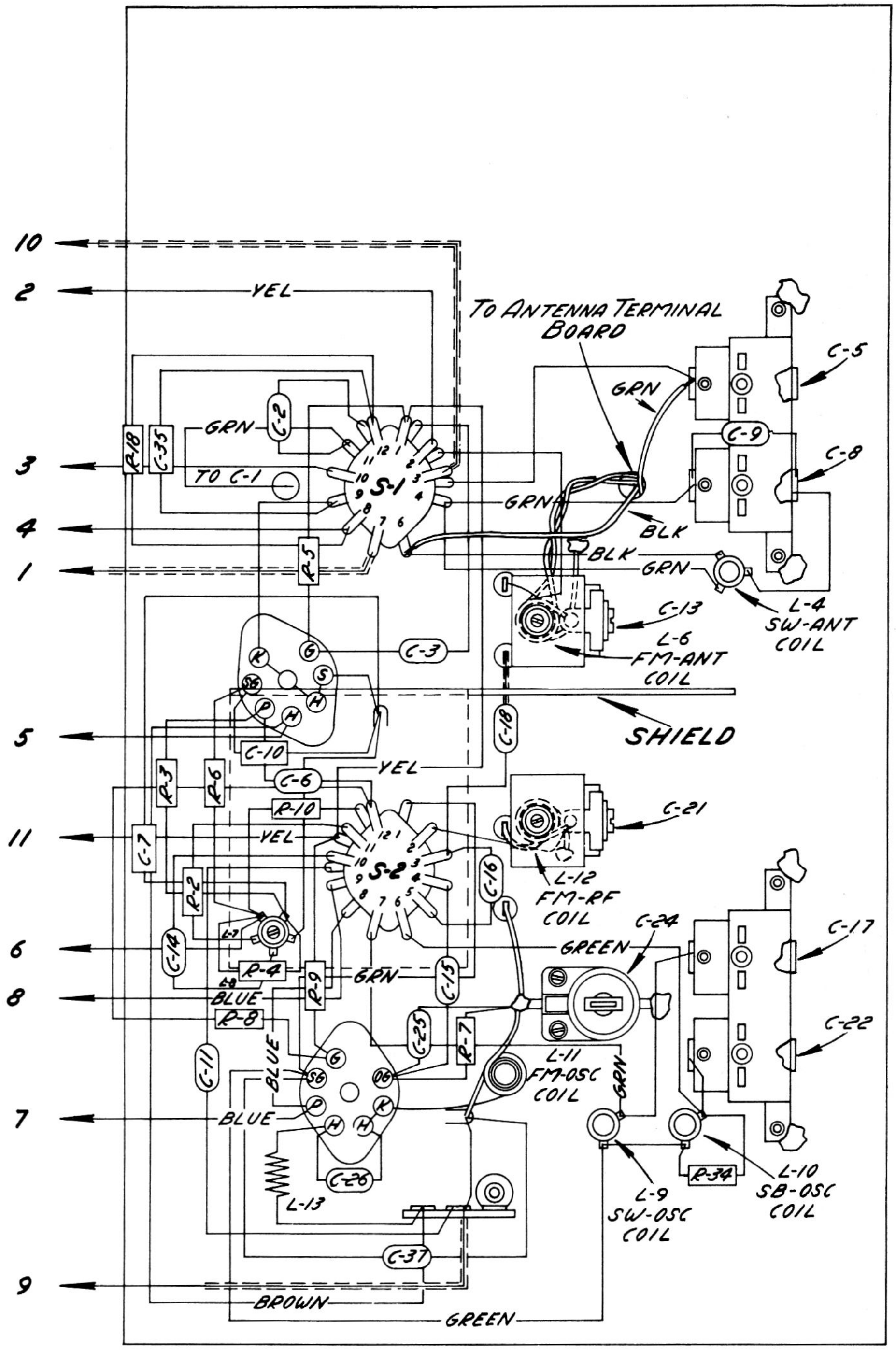


Fig. 7—Wiring Diagram of R.F. Sub Chassis.

RADIOTRON SOCKET VOLTAGES

TYPE	CIRCUIT	PLATE	SCREEN	CONT GRID	OSC. GRID AM	OSC. GRID FM	OSC. GRID FREQ.	CATHODE	HEATER
6BA6	R.F.	130	60						6.3 A.C.
6BE6	CONV.	180	100		16 −7	−3	600 kc. 1500 kc. 100 mc.		6.3 A.C.
6BA6	1st I.F.	180	90						6.3 A.C.
6BA6	2nd I.F.	180	90						6.3 A.C.
6AL5	Ratio Detector								6.3 A.C.
6AT6	Det.-AVC & Audio	80							6.3 A.C.
6AT6	Phase Inverter	80							6.3 A.C.
6V6GT	Output	275	175					+10	6.3 A.C.
6V6GT	Output	275	175					+10	6.3 A.C.
5Y3GT	Rectifier	275 A.C. (Pin 4) 275 A.C. (Pin 6)							5.0 A.C.
"B" Voltage measured from Rectifier Fil. (5Y3GT) to Gnd.—275 Volts.									

Note:—All the above values hold within plus or minus 20% when measured with a RCA Voltohmyst or equivalent, on a line voltage of 117 volts. All voltages are measured to chassis.

ALIGNMENT PROCEDURE

Before aligning set, completely mesh the gang and set the dial pointer on the mechanical maximum calibration point at the extreme left hand end of the dial. (See Fig. 10.)

When making a complete alignment follow in proper sequence the tabulated form on page 9.

If only a portion of the circuit is to be aligned select the portion required, followed by the remaining steps in the chart. Any adjustments made on the FM 10.7 mc. I.F.'s make it necessary to realign the A.M. 455 kc. I.F.'s.

For "S.B." and 31-25-19M band alignment use output meter across voice coil keeping Test Oscillator output as low as possible to prevent AVC action.

Cathode-ray oscilloscope and sweep signal generator alignment of the 455 kc. A.M. I.F. transformers is the preferable method. Connect oscilloscope across the volume control. If the required equipment is not available use the method outlined below.

CRITICAL LEAD DRESS

(Make lead dress before alignment)

1. Dress green lead from antenna terminal board pin 4 away from chassis.
2. All F.M. coil connections must be kept to the exact length of the original (one-sixteenth inch difference in length may be excessive).
3. All wiring in the receiver is critical as to length and placement. It is therefore important when servicing, that extreme care should be taken so as not to disturb more of the wiring than absolutely necessary.

NOTE: Keep tuning capacitor grounding brushes clean and under correct tension for proper contact.

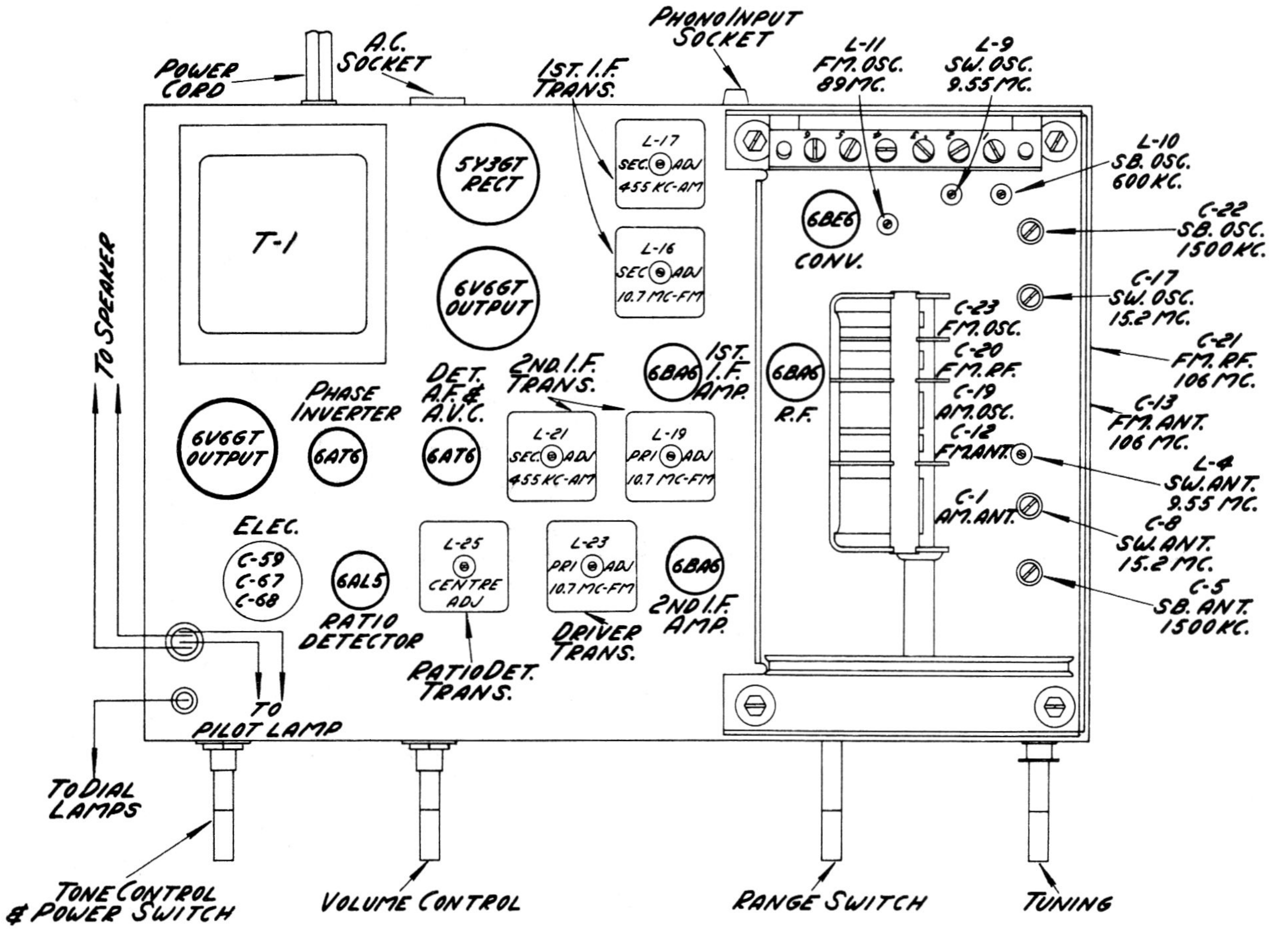


Fig. 8—Chassis Layout and Alignment Adjustments.

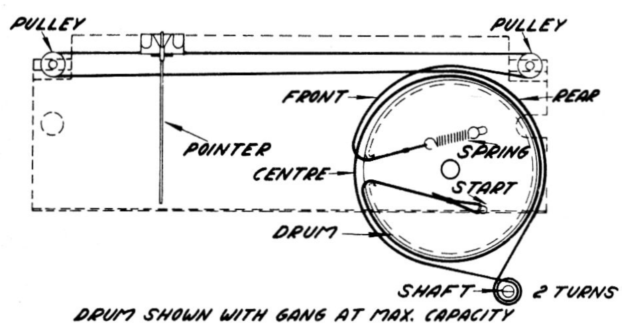


Fig. 9—Dial Cord Stringing.

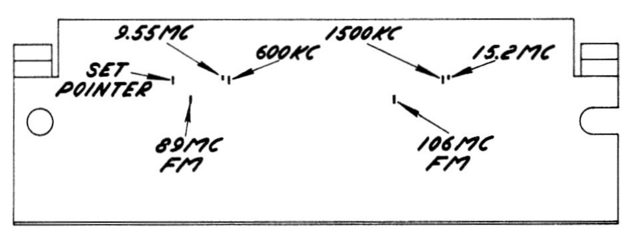


Fig. 10—Alignment Calibration Markers.

ALIGNMENT CHART

ORDER OF ALIGNMENT		TEST OSCILLATOR CONNECT "HI" SIDE TO	CONNECT "LO" SIDE TO	DUMMY ANTENNA	FREQUENCY SETTING	RANGE SELECTOR	RECEIVER DIAL SETTING	CIRCUIT TO ADJUST	ADJUSTMENT SYMBOLS	NOTES
F.M. RATIO DETECTOR ALIGNMENT	1	Connect a 1000 ohm resistor between lugs "C" and "D" of the ratio detector trans. Connect DC probe of a Voltohmyst to the negative lead of the 10 mfd elec. capacitor C-56. The common lead of the meter is connected to the chassis.								
	2	6BA6 2nd I.F. Grid	Ground	.01 mfd	10.7 MC 30% Mod. 400 Cy.Am.	F.M.	Max.Cap (Fully Meshed)	Driver Trans-former	L-23 Det. Trans.	For Max. D.C. Voltage Across C-56
	3	Remove meter leads and disconnect the 1000 ohm resistor from "C" and "D" on ratio det. trans. Connect two 100,000 ohm resistors (within 1% of being equal) in series across C56. Connect the common lead of the Voltohmyst to the centre point of the 100,000 ohm resistors and the D.C. probe to pin "B" of ratio det. trans. Use 30 volt scale for preliminary alignment. Complete alignment using 3 volt scale								
	4	Same	Same	Same	Same	Same	Same	Ratio Det. Trans.	Bottom Core L-25	†† For Zero D.C. Balance
		Near the correct core position the zero point is approached rapidly and continued adjustment causes the indicated polarity to reverse. A slow approach to the zero point is an indication of severe detuning, and the bottom core should be turned in the opposite direction..								
	5	Same	Same	Same	Same	Same	Same	Ratio Det. Trans	Top Core L-25	†† For Minimum Audio Output
		NOTE:- Two or more points may be found which will satisfy the condition required. Top core should be correctly adjusted when approximately 1/8 inch of threads extend above the can, therefore, it is desirable to start adjustment with the top core in its furthest "in" position and turn out, while adjusting the bottom core, until the first point of minimum AF and minimum DC is reached. †† The zero DC balance and the minimum AF output should occur at the same point: if such is not the case, the two cores should be adjusted until both occur with no further adjustment of either core. It may be advantageous to adjust both cores simultaneously, watching the Voltohmyst, and an output meter connected across the voice coil for the point at which both zero DC and minimum output occurs.								
	6	Reconnect Voltohmyst as in step 1, omitting 1000 ohm resistor.								
	7	Repeat step 2, omitting 1000 ohm.								
	8	Remove all connections.								
F.M. I.F. ALIGNMENT	9	Connect the DC probe of a Voltohmyst to the negative lead of the 10 mfd electrolytic capacitor C56 and the common lead of the meter to chassis ground.								
	10	6BA6 1st I.F. Grid	Ground	.01 mfd.	10.7 MC 30% Mod. 400 Cy.Am.	F.M.	Max.Cap (Fully meshed)	2nd I.F. Trans.	L-19 and L-20	*Adjust test Osc. Output for 6-10 Volts developed across C-56 use very short leads
		* Top and bottom cores alternately loading primary & secondary of each trans. with 1000 ohms while the opposite side of the same trans. is being adjusted. Adjust all trans. for max. voltage across C-56. This method is known as alternate loading which involves the use of a 1000 ohm resistor to load the plate winding while the grid winding of the same transformer is being peaked. Then the grid winding is loaded with 1000 ohm resistor while the plate winding is being peaked. When the windings are loaded, it is necessary to increase the 10.7 MC input since the gain will decrease and the voltage across C56 will be less.								
	11	6BE6 Mixer grid	Same	Same	Same	Same	Same	1st I.F. Trans.	L-15 and L-16	* Adjust test Osc. Output for 6-10 Volts developed across C-56 use very short leads
A.M. I.F. ALIGNMENT	12	6BA6 1st I.F. Grid	Ground	.01 mfd.	455 KC 30% mod. 400 Cy.Am.	S.B.	High Freq. end of Dial	2nd I.F. Trans.	L-21 and L-22	Adjust for max. Voltage across Voice Coil.
		It is necessary to alternately load the primary and secondary of each 455 KC I.F. trans. with 10,000 ohms while the opposite side of the same trans. is being adj.								
	13	6BE6 Mixer Grid	Same	Same	Same	Same	Same	1st I.F. Trans.	L-17 and L-18	Same
	14	#6 on Ant. Ter. Board	Ground	200 mmf.	Same	S.B.	1500 KC. Calibration point on dial plate	Wave trap	L-8	Adjust for min. voltage across voice coil.
S.B. ALIGNMENT	15	#6 on Ant. Ter. Board	Ground	200 mmf.	1500 KC 30% Mod. 400 Cycles	S.B.	1500 KC. Calibration point on dial plate	Oscillator	C-22	Adjust for max. voltage across voice coil.
	16	Same	Same	Same	Same	Same	Same	Ant.	C-5	Same
	17	Same	Same	Same	600 KC 30% Mod. 400 Cy.Am.	Same	600 KC. Calibration point on dial plate	Oscillator	L-10	Same
		NOTE:- The oscillator must be rocked into the loop at 600 KC.								
	18	Repeat steps 15 to 17 for max. output.								
25-19M ALIGNMENT	19	#6 on Ant. Ter. Board	#3 on Ant. Ter. Board	300 Ohms	15.2 MC 30% Mod. 400 Cy.Am.	31-25-19M	15.2 MC Calibration point on dial plate	Oscillator	C-17	Adjust for Max. Voltage across voice coil
	20	Same	Same	Same	Same	31-25-19M	Same	Ant.	C-8	Same
	21	Same	Same	Same	9.55 MC 30% Mod. 400 Cy.Am.	31-25-19M	9.55 MC Calibration point on left hand end of dial plate	Oscillator	L-9	Same
	22	Same	Same	Same	Same	25-19M	Same	Ant.	L-4	Same
	23	Repeat steps 19 to 22 for maximum output.								
		NOTE:- To guard against the possibility of alignment of L-9 and C-17 to image frequency, tune the test oscillator and receiver to 15.2 MC, then set test oscillator to 16.11 MC (image frequency). Increase the test oscillator output; A signal should be heard. Then tune test osc. and receiver to 9.55 MC. Reset test osc. to 10.46 MC (image frequency) and increase test osc. output; A signal should be heard. If these image frequencies cannot be heard, the receiver is incorrectly aligned, Therefore repeat steps 19 to 23.								
F.M. ALIGNMENT	24	#1 on Ant. Ter. Board	#2 on Ant. Ter. Board	150 Ohm Resistor in Series with each Lead	106 MC 30% Mod. 400 Cy.Am.	F.M.	106 MC Calibration point on dial plate	Oscillator	C-24	Adjust for Max. Voltage across C-56 (Use Voltohmyst)
	25	Same	Same	Same	89 MC 30% Mod. 400 Cy.Am.	Same	89 MC Calibration point on dial plate	Oscillator	L-11	Same
		NOTE:- Two points may be found to fulfill the requirements. Use the one with the longest threaded end extending out of the transformer.								
	26	Repeat steps 24 and 25 for exact calibration.								
	27	Same	Same	Same	106 MC 30% Mod. 400 Cy.Am.	Same	106 MC Calibration point on dial plate	R.F.	C-21	Same
		NOTE:- Two points may be found having the greatest voltage developed. Use the one with greater capacity (tighter adjustment).								
	28	Same	Same	Same	89 MC 30% Mod. 400 Cy.Am.	Same	89 MC Calibration point on dial plate	R.F.	L-12	Same
		NOTE:- Two points may be found to fulfill the requirements. Use the one with the longest threaded end extending out of the transformer.								
	29	Repeat steps 27 and 28 for maximum output.								
	30	Same	Same	Same	106 MC 30% Mod. 400 Cy.Am.	Same	106 MC Calibration point on dial plate	Ant.	C-13	Same
	31	Same	Same	Same	89 MC 30% Mod. 400 Cy.Am.	Same	89 MC Calibration point on dial plate	Ant.	L-6	Same
	32	Repeat steps 30 and 31 for maximum output.								

REPLACEMENT PARTS FOR MODELS VRA101M & VRA101C

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers.

STOCK NO.	DESCRIPTION	
	RADIO CHASSIS ASSEMBLIES	
S-4017	Board-terminal board..............	
S-3697	Capacitor-trimmer assembly (C5,C8, C17,C22)......................	
S-3698	Capacitor-ceramic trimmer (C24)....	
39616	Capacitor-33 MMF 5% mica(C9,C14)...	
S-4219	Capacitor-39 MMF 5% ceramic(C25)...	
S-4220	Capacitor-47 MMF 5% ceramic(C15)...	
S-3510	Capacitor-68 MMF 20% mica (C4).....	
45233	Capacitor-100 MMF 10% ceramic(C26).	
S-4221	Capacitor-220 MMF 5% ceramic(C3,C6, C55).........................	
39636	Capacitor-220 MMF 5% mica (C2).....	
39640	Capacitor-330 MMF 5% mica (C16)....	
39642	Capacitor-390 MMF 5% mica (C11)....	
39644	Capacitor-470 MMF 5% mica (C37,C62)	
14498	Capacitor-680 MMF 5% mica (C18)....	
S-3646	Capacitor-.005 MFD (C7,C10,C32,C33, C34,C41,C44,C46,C53,C61,C63,C66, C69)........................	
S-3647	Capacitor-.007 Mfd. (C51,C52).......	
S-3648	Capacitor-.010 Mfd. (C27,C35,C50, C57,C60,C64,C65)................	
S-3651	Capacitor-.025 Mfd. (C58)..........	
36718	Capacitor-10 Mfd. Electrolytic (C40,C56)......................	
S-2894	Capacitor-10 Mfd. Electrolytic(C70)	
S-3720	Capacitor-20-10-20 Mfd.Electrolytic (C59,C64,C66)..................	
S-3684	Condenser-Variable,tuning cond.with drum(C1,C12,C19,C20,C23).........	
S-3607	Coil-Antenna coil Short Wave(L3,L4)	
S-3679	Coil-Oscillator coil Short Wave(L9)	
S-3680	Coil-Oscillator coil Standard Broadcast (L10).................	
S-3678	Coil-Oscillator coil F.M. (L11)....	
32634	Cord-Drive cord (universal)........	
16058	Grommet-Rubber grommet for mounting R.F. sub-chassis (Pkg.5)........	
S-4172	Grommet-Rubber grommet for mounting main chassis (Pkg.3)............	
S-3621	Indicator-station selector pointer.	
11765	Lamp-Dial lamp (Mazda 51)..........	
S-4300	Plate-Dial backplate with pulleys..	
34761	Resistor-10 ohms 10% 1/4 watt(R8)..	
30732	Resistor-47 ohms 1/2 watt (R13)....	
30538	Resistor-330 ohms 20% 1/2 watt(R2).	
5164	Resistor-560 ohms 1/4 watt (R27)...	
34766	Resistor-1,000 ohms 20% 1/2 watt (R26)..........................	
S-2594	Resistor-1,800 ohms W.W. (R37).....	
34767	Resistor-2200 ohms 1/2 watt(R3,R4, R11,R16).......................	
3078	Resistor-10,000 ohms 1/2 watt(R10, R33)...........................	
36714	Resistor-15,000 ohms 1/4 watt(R25).	
30492	Resistor-22,000 ohms 1/2 watt(R7, R15,R17,R20)...................	
3077	Resistor-30,000 ohms 1/2 watt(R23).	
30685	Resistor-33,000 ohms 1/2 watt(R14).	
12266	Resistor-39,000 ohms 1/4 watt(R40).	
30787	Resistor-47,000 ohms 1/4 watt(R34).	
14138	Resistor-68,000 ohms 1/2 watt(R6)..	
14583	Resistor-220,000 ohms 1/2 watt(R19, R28,R38,R41).....................	
30648	Resistor-470,000 ohms 1/2 watt(R36).	
30653	Resistor-560,000 ohms 1/2 watt(R29).	
30652	Resistor-1 Megohm 1/2 watt(R1,R5, R12,R18,R22)......................	
30649	Resistor-2.2 Megohms 1/2 watt (R9)..	
30992	Resistor-10 Megohms 1/2 watt(31,R32, R35)............................	
S-4226	Shaft-Tuning drive shaft...........	
31364	Socket-Dial lamp socket............	
36069	Socket-Tube socket(Miniature with center shield)..................	
51384	Socket-Tube socket(Miniature)....	
31319	Socket-Tube socket (Octal).......	
14278	Socket-Phono socket.............	
31418	Spring-Drive cord spring (Pkg.2).	
S-4223	Switch-Range switch (S1,S2)......	
S-4225	Tone Control-1 Megohm (S3,R30)...	
S-3667	Transformer 1st I.F.-A.M.(L17, L18,C30,C31).................	
S-3668	Transformer 2nd I.F.-A.M.(L21, L22,C36,C42,C43,C45)..........	
S-4010	Transformer-1st I.F.-F.M.(L15, L16,C28,C29)..................	
S-4011	Transformer-2nd I.F.-F.M.(L19, L20,C38,C39)..................	
S-3703	Transformer-Driver-F.M.(L23,L24, C47)........................	
S-3702	Transformer-Ratio Det.F.M.(L25, C48,C49).....................	
S-3722	Transformer-Power-60 cycle (T1)..	
S-4297	Transformer-Power 25 cycle (T1)...	
S-4038	Transformer-Output (T2)(L26,L27).	
S-4224	Volume Control-500,000 ohms (R24)	
2917	Washer-"C" washer for tuning drive shaft (Pkg.10)..........	
S-3739	Wave trap (L8) Choke (L7)........	
	SPEAKER ASSEMBLIES (12" P.M.)	
S-4298	Board-speaker terminal board.....	
13867	Dust cap (Pkg.5)................	
S-4299	Cone-Cone & voice coil assembly(L28)	
S-4288	Speaker (complete)..............	
	AUTOMATIC RECORD CHANGER MECHANISM	
Refer	to Model 960001-4 Service Note for replacement parts & Service Data.	
	PULL OUT MECHANISM ASSEMBLIES	
S-4182	Door balancing assy.(complete)...	
S-4180	Fibre washer (Pkg.3)............	
S-4169	Hex.nut for door balance assembly	
S-3742	Pull-out mechanism(record player)	
S-4179	Rubber washer (Pkg.2)...........	
S-4176	Set screw for door balance assy. (Pkg.3)......................	
S-4046	Slide holder & carriage.........	
S-4047	Slide bar (L.H.)................	
S-4048	Slide bar (R.H.)................	
S-4177	Spring washer for door balance assy.(Pkg.3)..................	
S-4166	Spring-balancing spring..........	
S-4178	Stud for door balancing assy.....	
S-4168	Support-door fall support........	
	MISCELLANEOUS ASSEMBLIES	
	Antenna-F.M.(see R.F.transmission line).	
33545	Cap-pilot lamp cap............	
S-3924	Catch-door catch & strike plate (VRA101C)	
S-3925	Catch-door catch& strike plate (VRA101M)	
S-4167	Clamp-back cover clamp(Pkg.10)...	
S-4228	Cloth-grille cloth(VRA101C)......	
S-4229	Cloth-grille cloth(VRA101M)......	
S-4216	Decal-(front panel)..............	
36386	Decal-(Record drawer)............	
S-3658	Dial-Dial Scale (VRA-101M).......	
S-4227	Dial-Dial Scale (VRA-101C).......	
S-4230	Grille-metal grille (VRA-101C)...	
S-4231	Grille-metal grille (VRA-101M)...	
S-4293	Handle-Door handle(VRA101C)......	
S-4289	Handle-Door handle(VRA101M)......	
13103	Jewel-Amber jewel................	
S-4291	Knob-Door knob(VRA-101C).........	
S-4292	Knob-door knob(VRA-101M).........	
34489	Knob-Tuning,volume,tone..........	
37837	Knob-Range.......................	
31480	Lamp-pilot lamp (Mazda 47).......	
S-4022	Loop-Antenna loop (L1,L2)........	
5133	Pin-Speaker cable pin(Pkg.5).....	
S-4009	Spring-conical spring to mount record changer................	
14270	Spring-retaining spring for knob (Pkg.3).....................	
70788	R.F.transmission line(see Fig.1 for antenna assembly details).. ft.	