RCA VICTOR

"HIS MASTER'S VOICE"

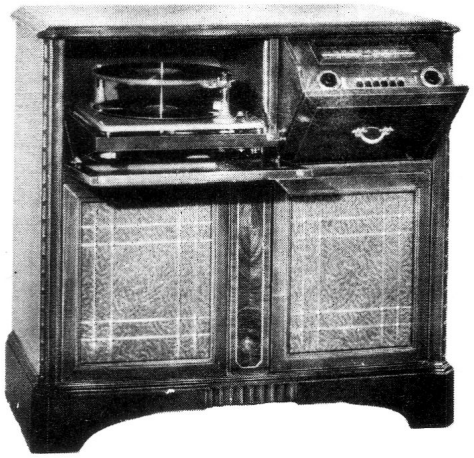
MODEL VRA 141

Fourteen-Tube, Four-Band, A.M.-F.M. Superheterodyne Radio-Phonograph Combination

TECHNICAL INFORMATION AND SERVICE DATA

1948 No. 10

GENERAL SERVICE DIVISION • R C A VICTOR COMPANY LTD.



Model VRA 141

Electrical and Mechanical Specifications

FREQUENCY RANGE

Standard Broadcast S.B.	540-1600 k.c.
Short Wave 49-31 M	5.7-12.0 mc
25-19 M	11.5-15.8 mc
Frequency Modulation	88-108 mc
Intermediate Frequency AM	455 kc
Intermediate Frequency FM	10.7 mc
Tuning Drive Ratio	20 to 1

POWER OUTPUT

Undistorted	9 watts
Maximum	12 watts

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycle, 145 watts
Rating B	105-125 volts, 25-60 cycle, 145 watts

LOUDSPEAKER

Type	12 inch Electrodynamic
Voice coil impedance	2.2 ohms at 400 cycles

PHONOGRAPH

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

RADIOTRON COMPLEMENT OF RADIO CHASSIS

(1) Type 6BA6	RF Amplifier
(2) Type 6BA6	Mixer
(3) Type 6BE6	Oscillator
(4) Type 6BA6	1st IF
(5) Type 6BA6	2nd IF
(6) Type 6AL5	F.M. Ratio Detector
(7) Type 6AT6	A.M. Det., A.V.C. & 1st A.F.
(8) Type 6U5	Tuning Indicator

RADIOTRON COMPLEMENT OF AMPLIFIER CHASSIS

(1) Type 6SC7	Phase Inverter
(2) Type 6F6G	Power Output
(3) Type 6F6G	Power Output
(4) Type 5U4G	Full Wave Rectifier

RADIOTRON COMPLEMENT OF MAGIC MONITOR CHASSIS

(1) Type 6AV6	Control Amplifier & Rectifier
(2) Type 6BA6	Reactance Tube
Pilot Lamps (2)	Mazda No. 51 6-8 volts, 0.2 amp.
(1)	Mazda No. 47 6-8 volts, 0.15 amp.

CABINET DIMENSIONS (inches)

	Height	Width	Depth
VRA 141	36 3/32	39 1/2	18 17/32

PICKUP

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

VRA 141

GENERAL DESCRIPTION

The RCA Victor Model VRA 141 AM-FM radio phonograph combination is housed in a console cabinet of striking beauty. The AM-FM receiver is a fourteen tube, four band superheterodyne using the most up-to-date circuits for high quality radio and phonograph 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; Highly selective RF stage; Separate oscillator tube for improved oscillator stability; Iron core R.F.; oscillator and I.F. coils; Push-button tuning of six Standard Broadcast stations by means of pretuned circuits; "Amplitude Ignorer" for improved rejection of AM when receiving FM; Ratio detector for high quality FM reproduction; Automatic volume control circuits; Tuning indicator tube; Full range variable tone control; Tone compensated volume control; Magic Monitor for improved phonograph reproduction; Push-pull output stage and twelve inch duo-cone electrodynamic loudspeaker. The Model VRA-141 uses a 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.

Since the new F.M. receiver circuits and the frequencies on which F.M. operates are new to the home receiver field, it is important that the serviceman be informed of the differences between F.M. receivers and the conventional A.M. receivers.

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.

For further details on antennas for F.M. refer to the Antennas section on this page.

CIRCUIT ARRANGEMENT

The circuit for A.M. reception uses a tuned R.F. stage in which the loop antenna is used as part of the first tuned circuit. This is followed by a mixer stage with separate oscillator tube. The use of a separate oscillator tube and the incorporation of temperature compensating capacitors in the tuned circuits greatly reduces the oscillator drift. The use of a separate oscillator tube also increases the gain of the mixer on the short-wave bands.

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 last transformers which are connected to the A.M. and F.M. detectors respectively. 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 two stage I.F. amplifier operates in the conventional manner.

A double diode triode acts as A.M. detector, A.V.C. and first audio amplifier. A phase inverter follows and 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 mixer stage with separate oscillator tube. 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. The use of a separate oscillator tube provides more gain in the mixer, in addition to the improved stability just mentioned. 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 a low gain limiter. 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, a double triode phase inverter and a push-pull pentode output stage. The Magic Monitor is fully described on Page 7.

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.

An external antenna for broadcast and short wave reception, when required, is connected to terminal 4.

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.

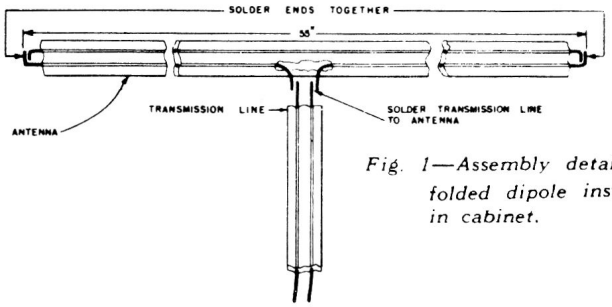


Fig. 1—Assembly details of folded dipole installed in cabinet.

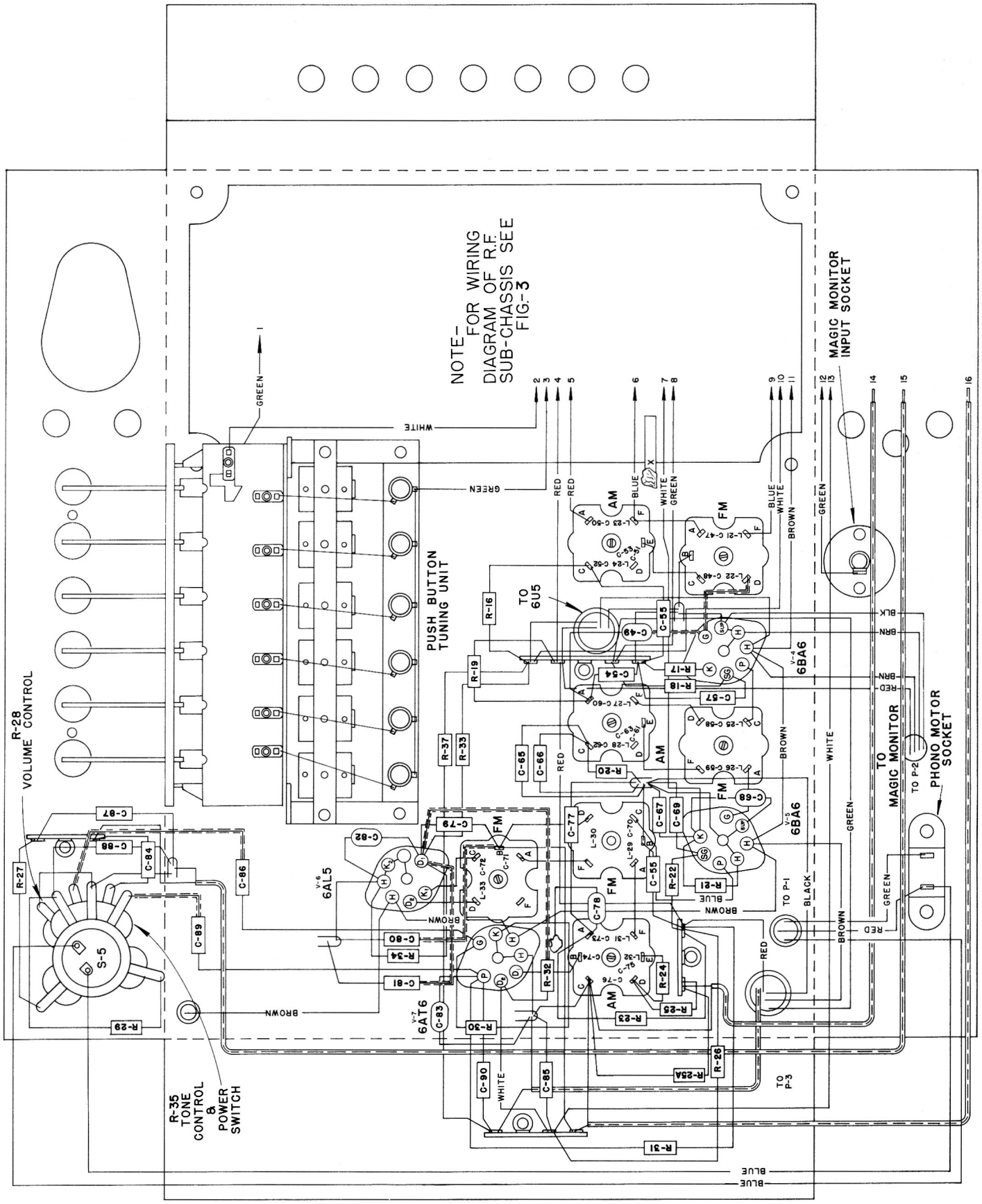


Fig. 2—Radio Tuner Chassis Wiring Diagram

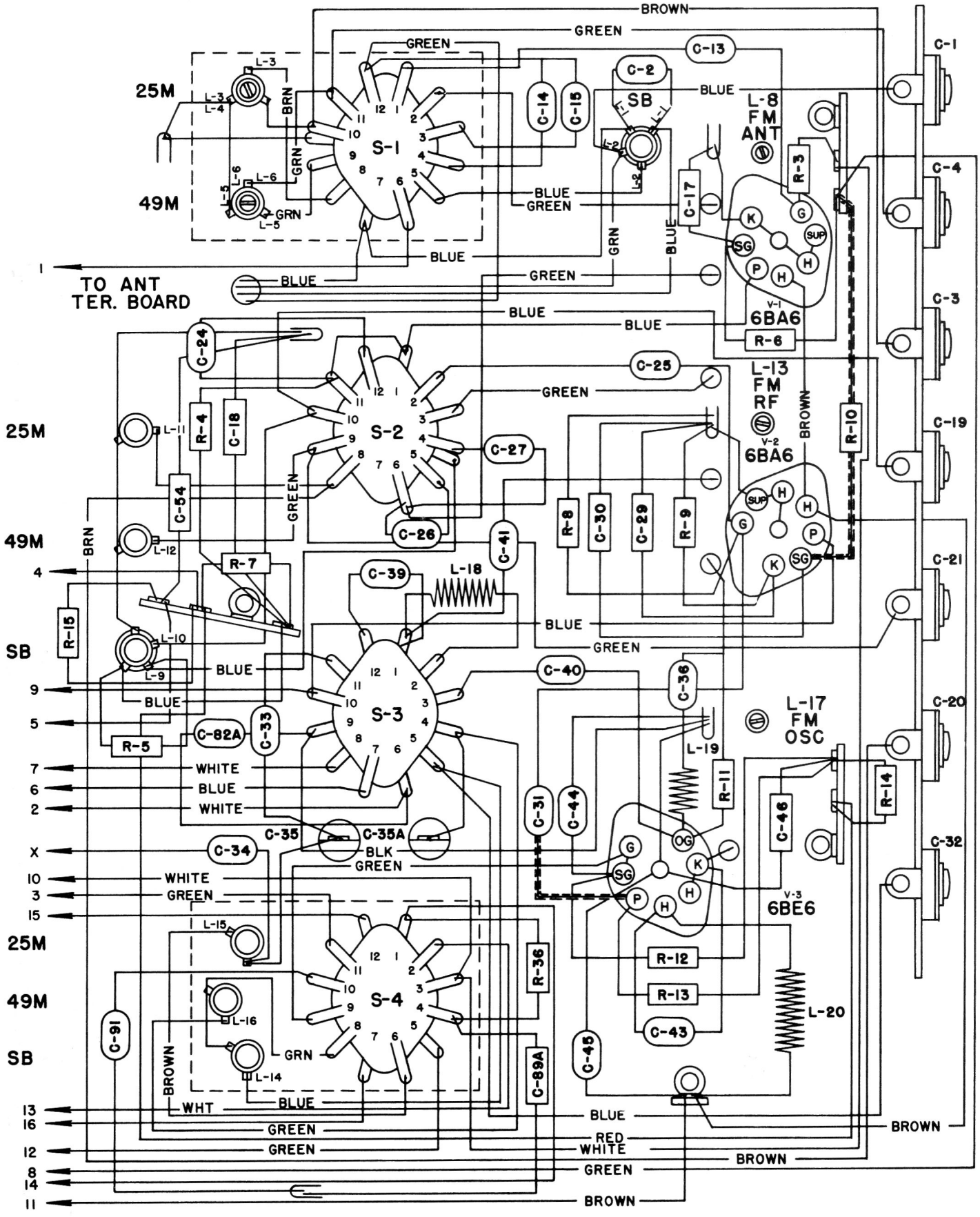


Fig. 3—R.F. Sub-chassis Wiring Diagram

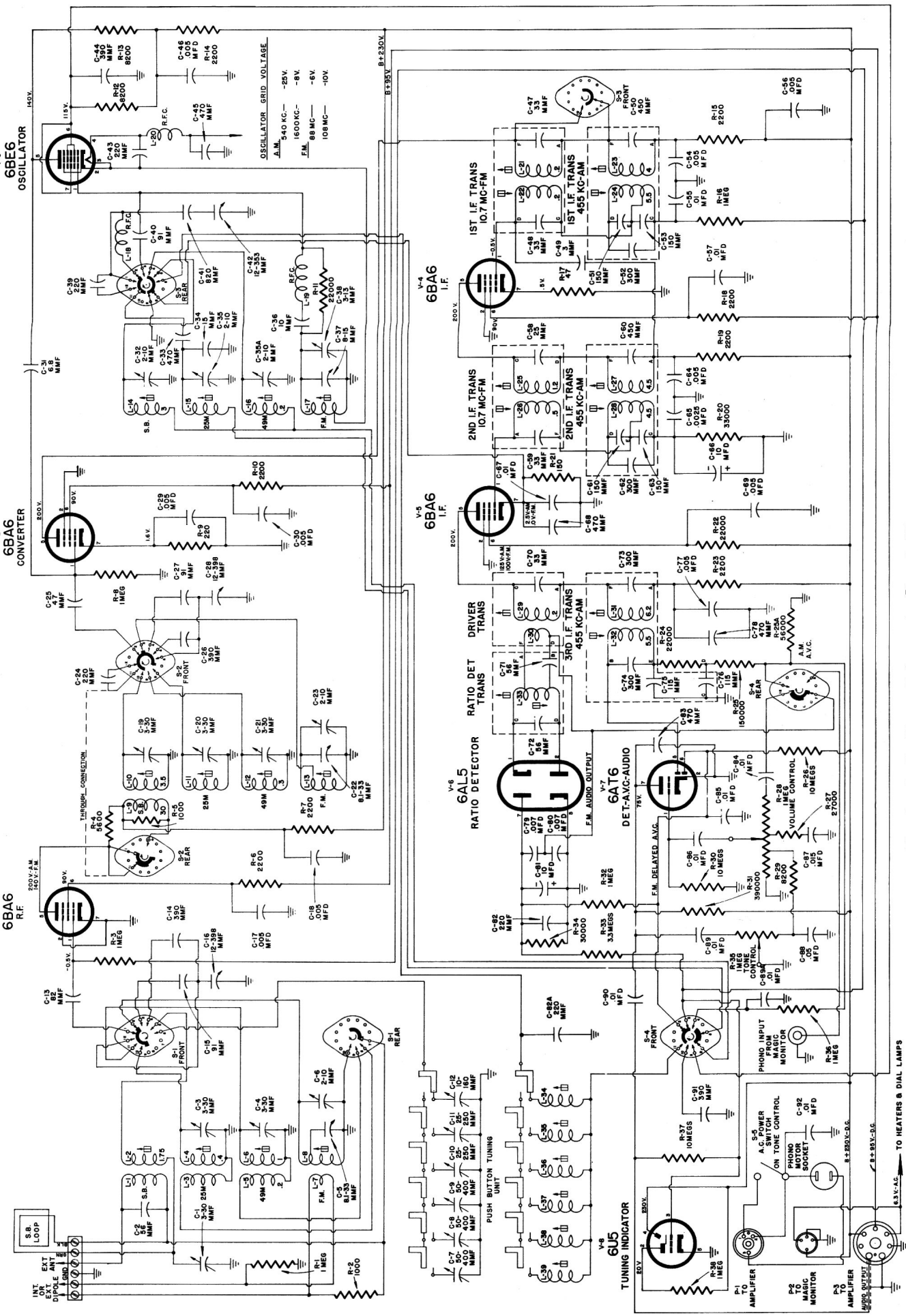


Fig. 4—Radio Tuner Schematic Circuit Diagram

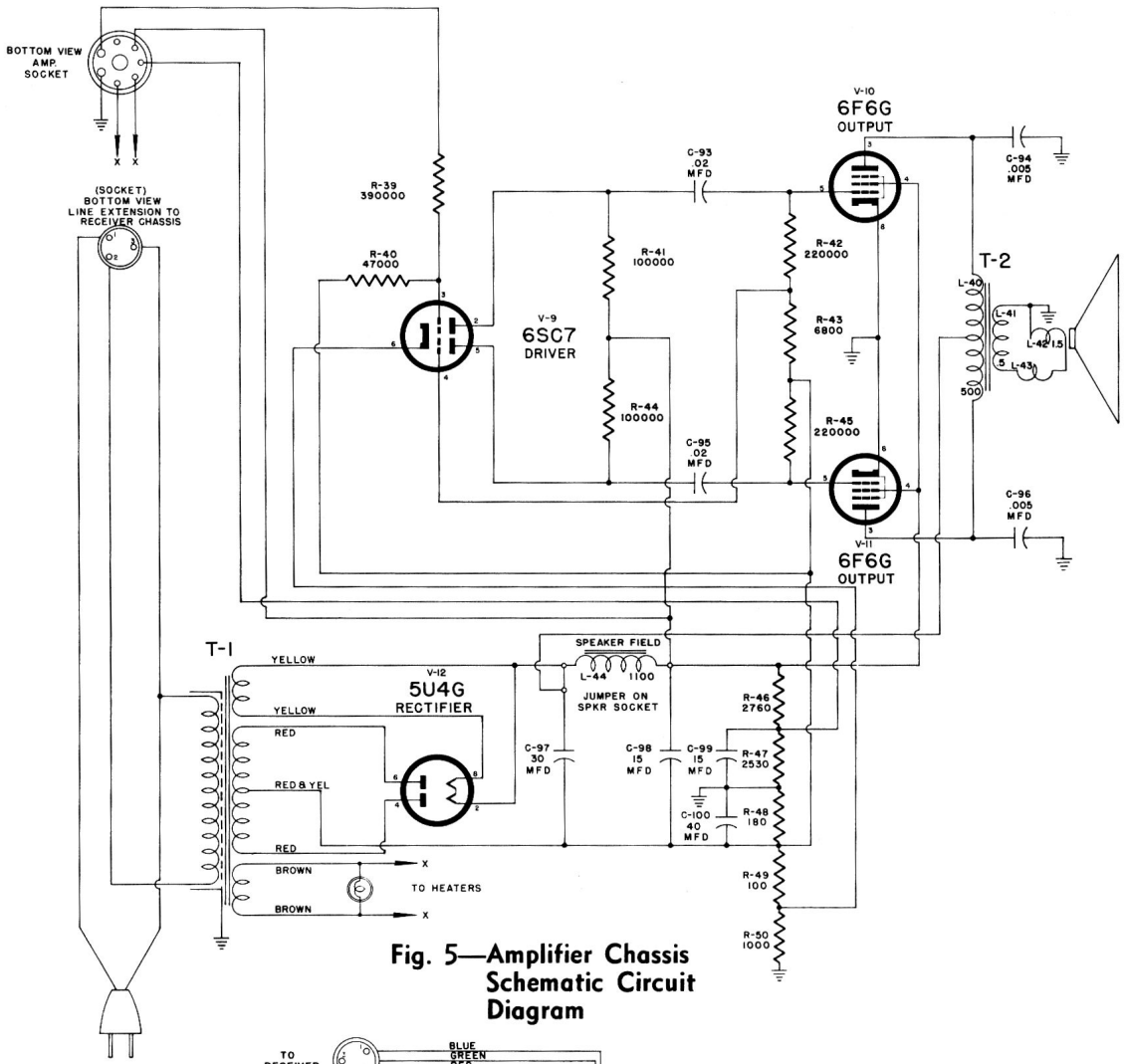


Fig. 5—Amplifier Chassis Schematic Circuit Diagram

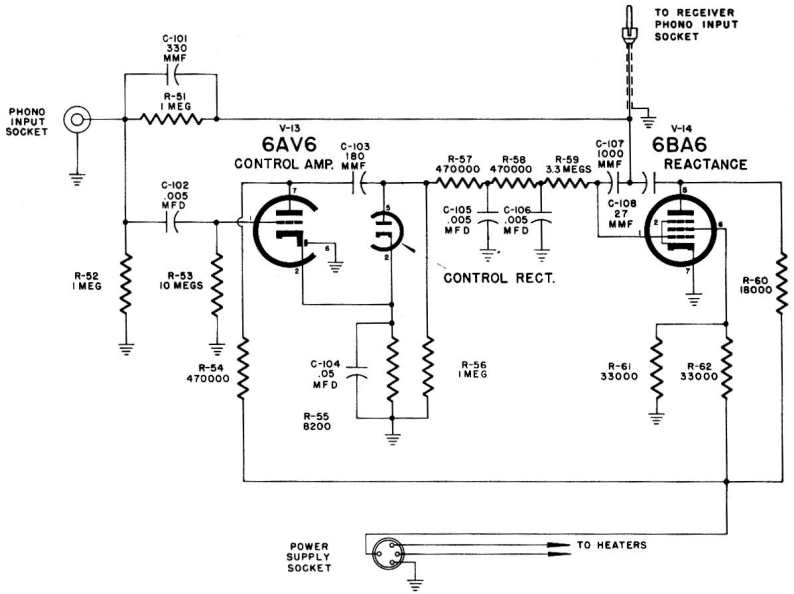


Fig. 7—Magic Monitor Schematic Circuit Diagram

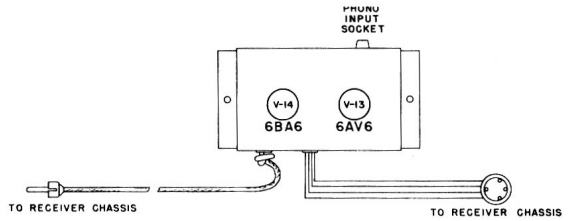


Fig. 8—Magic Monitor Chassis Layout

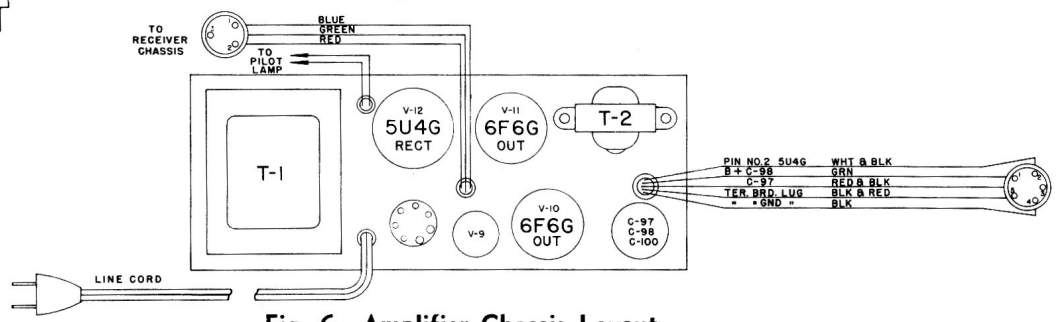


Fig. 6—Amplifier Chassis Layout

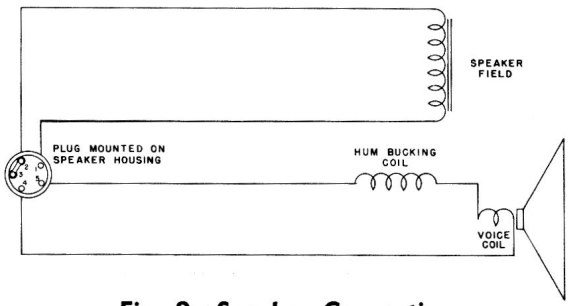


Fig. 9—Speaker Connections

MAGIC MONITOR SERVICE DATA

GENERAL DESCRIPTION

The RCA Magic Monitor circuit reduces the high frequency surface noise during the low-level passages on a phonograph record and permits maximum treble response during the high-level passages. The circuit consists of a reactance tube (6BA6), a half-wave rectifier (diode section of a 6AV6) and an amplifier (triode section of a 6AV6).

A portion of the audio signal is amplified, rectified and applied as a bias voltage to the grid of the reactance tube. This tube (connected across the output of the Magic Monitor) functions as a variable capacitance which shunts a controlled amount of the surface noise frequencies to ground.

During the low-level passages, when the surface noise tends to mask the high frequencies, the low bias voltage increases the capacitance of the reactance tube, and the surface noise is reduced. During the high-level passages, when the surface noise itself is masked by the signal, the high bias voltage decreases the capacitance of the tube, thus permitting all audio frequencies to pass relatively unaffected.

CIRCUIT ARRANGEMENT

Audio signals from the phonograph pickup pass from Magic Monitor input to output through the parallel combination C 10/ R 5 which functions as a tone compensation network. Connected across the output is the grid circuit of the reactance tube through 1000 mmfd. coupling capacitor C 107. This tube functions as a variable capacitance by virtue of the well known "Miller" effect. The capacity presented by the reactance tube (6BA6) grid is dependent upon the grid plate capacity C 108 and the reactance tube circuit gain. A decrease in grid-plate capacity or in circuit gain will decrease the effective capacity presented by the reactance tube grid. In the Magic Monitor, a variable mu tube (6BA6) is used and control exerted by variations in grid bias. A negative bias, dependent on the amplitude of the high frequency components in the signal, is provided by the diode section of the 6AV6 and filtered by the RC network between 6AV6 diode plate and 6BA6 reactance tube grid. The triode section of the 6AV6 amplifies a portion of the incoming signal and passes the high frequency components to the diode rectifier through the 180 mmfd coupling capacitor C 103.

TEST PROCEDURE

The Magic Monitor circuits may be tested for correct operation as follows:

1) Set the volume control for maximum amplifier gain.
2) Set the tone control for maximum high frequency response.
3) Connect an audio signal generator to the phono input socket through a 1500 mmfd capacitor.
4) Set the audio signal generator frequency to 5000 c.p.s. and adjust the output level until the voltage across the loudspeaker voice coil = 2 volts.
5) Ground the control rectifier diode plate (pin #5 on 6AV6 socket). This removes the bias from the 6BA6 reactance tube and increases the effective grid circuit capacity to its maximum value. The voltage across the loudspeaker voice-coil should be reduced to approximately 1.2 volts when the reactance tube operation is normal.
6) Adjust the audio signal generator output voltage to 0.25 volt.
7) Use an RCA Voltohmyst or equivalent instrument to measure the D.C. voltage developed across the control rectifier diode load resistor R56. This voltage should be approximately —10 volts when the control amplifier and rectifier operation is normal.

SERVICE DATA

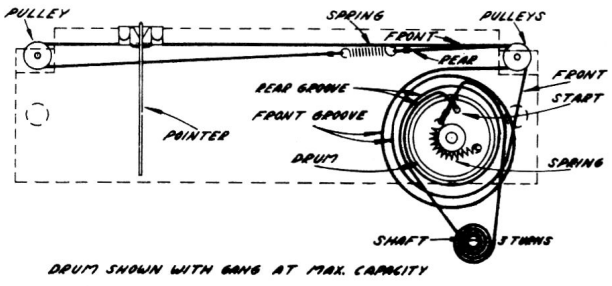


Fig. 10 — Dial Cord Stringing

ROLL-OUT AND TILT-OUT MECHANISMS

These mechanisms should ordinarily require little attention. Occasional lubrication of the record changer roll-out tracks with a light grease may be required to keep them operating freely. The radio tilt-out balance arm mechanism has a friction nut adjustment which is provided so that the door may be set to close fully and yet respond to light operating pressure. To adjust this friction nut first loosen the two set screws found around the rim. When adjustment is completed, re-tighten the set screws to prevent movement of the nut.

CRITICAL LEAD DRESS

(Make lead dress before alignment)

1. C86 and C89 must be dressed up against the chassis.
2. The lead from pin 5 of the 6BA6 R.F. amplifier tube to pin 1 on S2 rear must be kept short.
3. Dress lead connected from pin 5 of the 6BA6 mixer tube to pin 10 on S3 front away from chassis.
4. Lead from L13 to pin 3 on S2 front must be kept short.
5. Dress green lead from antenna terminal board pin 5 away from chassis.
6. Dress blue lead from C19 R.F. trimmer away from all adjacent components.
7. Dress all leads away from S2.
8. Twisted leads going to ON-OFF switch must be dressed against edge of chassis.
9. C44 leads must be kept short.
10. Dress lead from pin 3 of 6AL5 to pin 3 of 6AT6 away from pin 1 (grid) of 6AT6.
11. All F.M. coil connections must be kept to the exact length of the original (one-sixteenth inch difference in length may be excessive).
12. 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.

ALIGNMENT PROCEDURE

Make lead dress (page 5) before alignment

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. 11.)

When making a complete alignment follow in proper sequence the tabulated form below.

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.", 49-31M and 25-19M band alignment use output meter across voice coil keeping Test Oscillator output as low as possible to prevent AVC action.

Cathode-ray oscillocsope 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.

PUSH BUTTON ALIGNMENT

The push buttons may be adjusted for any six stations on the S.B. band. The preferable arrangement is to adjust for stations in order of frequency. Proceed as follows:

1. Turn "Range Selector" to S.B. position and manually tune in the first station, say 560 kc.
2. Turn "Range Selector" to P.B. position and press button No. 1 located at the left on the front panel.
3. Referring to Fig. 12, adjust core and trimmer No. 1 for a peak at 560 kc. This adjustment can be made with the assistance of the "Magic Eye". To align the push buttons with set still in cabinet, unfasten "Magic Eye" from its bracket and face to the rear.
4. Proceed to adjust the other five stations in order of frequency, as outlined above.

When a station is inaudible due to reception conditions a test oscillator may be substituted for the station signal.

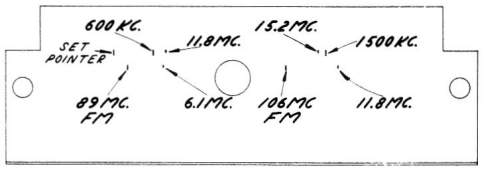


Fig. 11 — Alignment Calibration Markers

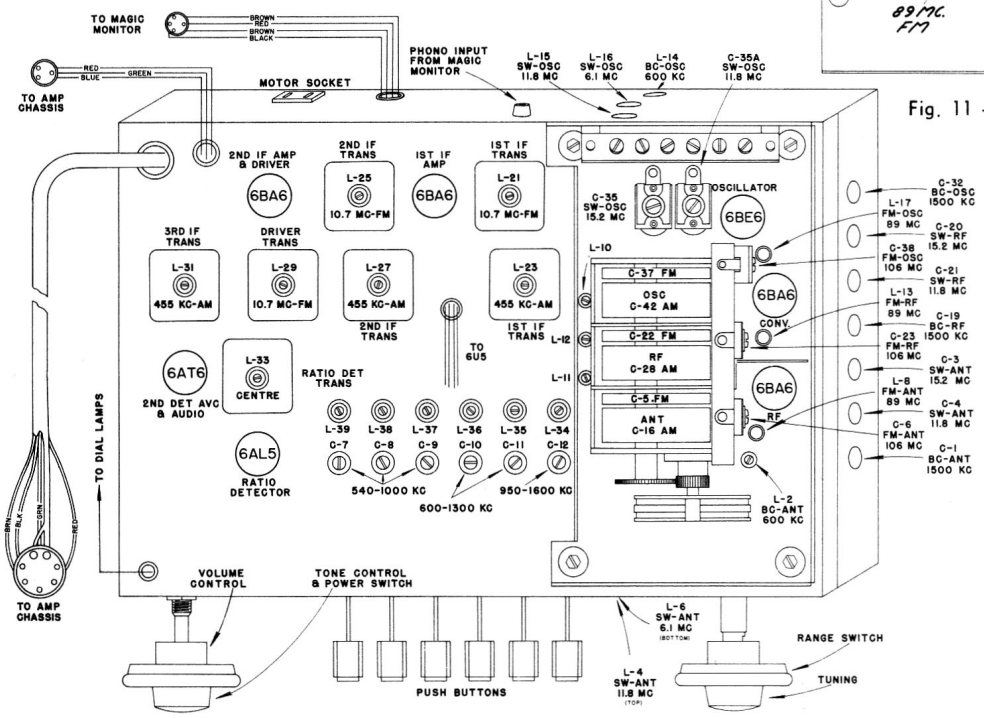


Fig. 12 — Chassis Layout and Alignment Adjustments

ALIGNMENT CHART

ORDER OF ALIGNMENT		TEST OSCILLATOR: CONNECT "HI" SIDE TO	TEST OSCILLATOR: CONNECT "LO" SIDE TO	TEST OSCILLATOR: DUMMY ANTENNA	TEST OSCILLATOR: 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-81. 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 Transformer	L-29 Det. Trans.	For Max. D.C. Voltage Across C-81
	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 C81. 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-33	†† For Zero D.C. Balance
	5	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.. Same	Same	Same	Same	Same	Same	Ratio Det. Trans	Top Core L-33	†† 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.								

ALIGNMENT CHART

ORDER OF ALIGNMENT		TEST OSCILLATOR: CONNECT "HI" SIDE TO	TEST OSCILLATOR: CONNECT "LO" SIDE TO	TEST OSCILLATOR: DUMMY ANTENNA	TEST OSCILLATOR: FREQUENCY SETTING	RANGE SELECTOR	RECEIVER DIAL SETTING	CIRCUIT TO ADJUST	ADJUSTMENT SYMBOLS	NOTES
F.M. I.F. ALIGNMENT	9	Connect the DC probe of a Voltohmyst to the negative lead of the 10 mfd electrolytic capacitor C81 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-25 and L-26	*Adjust test Osc. Output for 6-10 Volts developed across C-81 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-81. 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 C81 will be less.								
	11	6BE6 Mixer grid	Same	Same	Same	Same	Same	1st I.F. Trans.	L-21 and L-22	* Adjust test Osc. Output for 6-10 Volts developed across C-81 use very short leads
A.M. I.F. ALIGNMENT	12	6BA6 2nd I.F. Grid	Ground	.01 mfd.	455 KC 30% mod. 400 Cy.Am.	S.B.	High Freq. end of Dial	3rd I.F. Trans.	L-31 and L-32	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	6BA6 1st I.F. Grid	Same	Same	Same	Same	Same	2nd I.F. Trans.	L-27 and L-28	Same
	14	6BE6 Mixer Grid	Same	Same	Same	Same	Same	1st I.F. Trans.	L-23 and L-24	Same
S.B. ALIGNMENT	15	#4 on Ant. Ter.Board	Ground	200 mmf.	1500 KC 30% Mod. 400 Cycles	S.B.	1500 KC.Calibration point on dial plate	Oscillator	C-32	Same
	16	Same	Same	Same	Same	Same	Same	R.F.	C-19	Same
	17	Same	Same	Same	Same	Same	Same	Ant.	C-1	Same
	18	Same	Same	Same	600 KC 30% Mod. 400 Cy.Am.	Same	600 KC.Calibration point on dial plate	Oscillator	L-14	Same
	19	Same	Same	Same	Same	Same	Same	R.F.	L-10	Same
	20	Same	Same	Same	Same	Same	Same	Ant.	L-2	Same
	21	Repeat steps 15 to 20 for max. output.								
49-31M ALIGNMENT	22	#4 on Ant. Ter.Board	Ground	300 Ohms	11.8 MC 30% Mod. 400 Cy.Am.	49-31M	11.8 MC Calibration point on right hand end of dial plate	Oscillator	C-35A	Same
	23	Same	Same	Same	Same	Same	Same	R.F.	C-21	Same
	24	Same	Same	Same	Same	Same	Same	Ant.	C-4	Same
	25	Same	Same	Same	6.1 MC 30% Mod. 400 Cy.Am.	Same	6.1 MC Cal. point on dial plate	Oscillator	L-16	Same
	26	Same	Same	Same	Same	Same	Same	R.F.	L-12	Same
	27	Same	Same	Same	Same	Same	Same	Ant.	L-6	Same
	28	Repeat steps 22 to 27 for max. output.								
		NOTE:- To guard against the possibility of alignment of L-16 and C-35A to image freq., tune the test Oscillator and receiver to 11.8 MC. Then adjust test oscillator to 12.71 (image freq.). By increasing the test oscillator output, a signal should be heard. Next, tune test oscillator and receiver to 6.1 MC. Retune test oscillator to 7.01 MC (image freq.) and increase test oscillator output. A signal should then be heard. If these image freq. cannot be heard, the set is incorrectly aligned. Therefore repeat steps 22 to 28.								
25-19M ALIGNMENT	29	#4 on Ant. Ter.Board	#3 on Ant. Ter.Board	300 Ohms	15.2 MC 30% Mod. 400 Cy.Am.	25-19M	15.2 MC Calibration point on dial plate	Oscillator	C-35	Adjust for Max.Voltage across voice coil
	30	Same	Same	Same	Same	25-19M	Same	R.F.	C-20	Same
	31	Same	Same	Same	Same	25-19M	Same	Ant.	C-3	Same
	32	Same	Same	Same	11.8 MC 30% Mod. 400 Cy.Am.	25-19M	11.8 MC Calibration point on left hand end of dial plate	Oscillator	L-15	Same
	33	Same	Same	Same	Same	25-19M	Same	R.F.	L-11	Same
	34	Same	Same	Same	Same	25-19M	Same	Ant.	L-4	Same
	35	Repeat steps 29 to 34 for maximum output.								
		NOTE:- To guard against the possibility of alignment of L-15 and C-35 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 11.8 MC. Reset test osc. to 12.71 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 29 to 35.								
F.M. ALIGNMENT	36	#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-38	Adjust for Max.Voltage across C-97 (Use Voltohmyst)
	37	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.								
	38	Repeat steps 36 and 37 for exact calibration.								
	39	Remove connections or turn test oscillator off				Same	106 MC Calibration point on dial plate	R.F.	C-23	Same
		NOTE:- Two points can be found having the greatest noise voltage developed. Use the one with the greater capacity (tighter adjustment).								
	40	Same	Same	Same	Same	Same	89 MC Calibration point on dial plate	R.F.	L-13	Same
		NOTE:- Two points may be found to fulfill the requirements. Use the one with the longest threaded end extending out of the transformer.								
	41	Repeat steps 39 and 40 for maximum output.								
	42	#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.	Same	106 MC Calibration point on dial plate	Ant.	C-6	Same
	43	Same	Same	Same	89 MC 30% Mod. 400 Cy.Am.	Same	89 MC Calibration point on dial plate	Ant.	L-8	Same
	44	Repeat steps 42 and 43 for maximum output.								

REPLACEMENT PARTS FOR MODEL VRA141

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

STOCK NO.	DESCRIPTION
	RECEIVER ASSEMBLY
S-3612	Capacitor-Trimmer bank(C1,C4,C3,C19,C20,C21,C32)
S-3615	Capacitor-Trimmer bank(C7,C8,C9,C10,C11,C12)....
S-3613	Capacitor-Trimmer(C35,C35A).....
S-3614	Capacitor-Trimmer(C23,C6).....
S-3611	Capacitor-Ceramic trimmer (C38).....
S-4181	Capacitor-3 MMF 10% Ceramic (C49).....
39043	Capacitor-6.8 MMF 10% Ceramic (C31).....
45466	Capacitor-10 MMF 5% Ceramic (C36).....
31353	Capacitor-15 MMF 10% Ceramic (C34).....
39042	Capacitor-47 MMF 10% Ceramic (C25).....
70599	Capacitor-56 MMF Mica (C2).....
33104	Capacitor-82 MMF 10% Ceramic (C13).....
71021	Capacitor-91 MMF 5% Ceramic (C15,C27,C40).....
71920	Capacitor-220 MMF 10% Ceramic(C82A,C24,C39,C43, C82).....
39642	Capacitor-390 MMF Mica (C14,C26,C44,C91).....
39644	Capacitor-470 MMF 20% (C33,C45,C83,C78,C68).....
39650	Capacitor-820 MMF 5% (C41).....
S-3647	Capacitor-.007 MFD (C79,C80).....
S-3646	Capacitor-.005 MFD (C17,C18,C29,C30,C46,C77,C56, C54,C64,C69).....
S-3653	Capacitor-.05 MFD (C88).....
S-3649	Capacitor-.015 MFD(C87).....
S-3648	Capacitor-.01 MFD(C57,C55,C67,C84,C90,C92,C89A, C89,C86,C85).....
S-4423	Capacitor-Electrolytic-10 MFD (C66,C81).....
S-3616	Condenser-Variable(C5,C16,C22,C28,C37,C42).....
S-3598	P.B.Coils(L34-L35,L36,L37,L38,L39).....
S-3599	Coil Assembly Sw. Osc. (L15).....
S-3600	Coil Assembly Sw. Osc. (L16).....
S-3601	Coil Assembly B.C.Osc. (L14).....
S-3602	Coil Assembly F.M. Ant.(L7,L8).....
S-3603	Coil Assembly F.M. R.F.(L13).....
S-3604	Coil Assembly F.M. Osc.(L17).....
S-3605	Coil Assembly B.C. R.F.(L9,L10).....
S-3606	Coil Assembly B.C. Ant.(L2,L1).....
S-3607	Coil Assembly S.W. Ant.(L3,L4).....
S-3608	Coil Assembly S.W. Ant.(L5,L6).....
S-3685	Coil Assembly S.W. R.F.(L11).....
S-3686	Coil Assembly S.W. R.F.(L12).....
S-3681	Choke R.F. (L18,L20).....
S-3901	Choke R.F. (L19).....
S-4160	Drum-Dial drum.....
S-3621	Indicator-Station selector pointer.....
S-3609	Loop-Loop Assembly (broadcast).....
30732	Resistor-47 ohms,1/2 watt (R17).....
30880	Resistor-150 ohms,1/2 watt (R21).....
14561	Resistor-220 ohms,1/4 watt (R9) .....
34766	Resistor-1000 ohms,1/4 watt(R2,R5).....
34767	Resistor-2200 ohms,1/2 watt(R6,R7,R10,R14,R15, R18,R19,R23).
30734	Resistor-5600 ohms,1/2 watt (R4).....
14250	Resistor-8200 ohms,1/2 watt(R12,R13,R29).....
30492	Resistor-22000 ohms,1/2 watt(R11,R22,R24).....
30409	Resistor-27000 ohms,1/2 watt(R27).....
3152	Resistor-30000 ohms,1/4 watt(R34).....
30685	Resistor-33000 ohms,1/2 watt(R20).....
14020	Resistor-150000 ohms,1/2 watt(R25).....
11988	Resistor-390000 ohms,1/2 watt(R31).....
30652	Resistor-1 meg.1/2 watt(R1,R3,R8,R16,R32,R38,R36)
31417	Resistor-3.3 meg.(R33).....
30992	Resistor-10 meg.1/2 watt(R26,R30,R37).....
S-3617	Switch-Range Switch (S1,S2,S3,S4).....
S-3618	Switch-Pushbutton.....
S-3622	Shaft-Drive shaft.....
51384	Socket-Tube socket (miniature).....
S-2824	Socket-AC input.....
S-4269	Scale-Dial scale.....
S-3593	Transformer-I.F.1st A.M.(L24,L23,C50,C51,C52,C53)
S-3593	Transformer-I.F.2nd A.M.(L27,L28,C60,C61,C62,C63)
S-3594	Transformer-I.F.3rd A.M.(L31,L32,C73,C74,C75,C76)
S-4010	Transformer-I.F.1st F.M.(L21,L22,C47,C48).....
S-4011	Transformer-I.F.2nd F.M.(L25,L26,C58,C59).....
S-3703	Transformer-Driver (L29,L30,C70).....
S-3702	Transformer-Ratio Det. (L33,C71,C72).....
S-3619	Volume and Tone Control-1 meg.(R28)1 meg.(R36)..
	SPEAKER ASSEMBLY
13867	Cap-Dust Cap (Pkg.3).....
S-3589	Cone-Cone & voice coil assembly (L42).....
S-3587	Speaker.....
S-3588	Field Coil (L44).....
	AUTOMATIC RECORD CHANGER MECHANISM
	Refer to Model No. 960001-4 Service Note for replacement parts and service data.

STOCK NO.	DESCRIPTION
	AMPLIFIER ASSEMBLY
S-3646	Capacitor-.005 MFD (C94,C96).....
S-3650	Capacitor-.02 MFD (C93,C95).....
37877	Capacitor-Electrolytic 15 MFD (C98).....
36599	Capacitor-Electrolytic(30-15-40 MFD)(C97,C99, C100)..
S-3628	Cable-Speaker cable.....
S-3629	Cable-Power cable (Receiver).....
34765	Resistor-100 ohms, 1/2 watt (R49).....
34768	Resistor-1000 ohms,1/2 watt (R50).....
14659	Resistor-6800 ohms,1/2 watt (R43).....
30787	Resistor-47000 ohms, 1/2 watt (R40).....
3252	Resistor-100000 ohms,1/2 watt (R41,R44).....
14583	Resistor-220000 ohms,1/2 watt (R42,R45).....
11988	Resistor-390000 ohms,1/2 watt (R39).....
S-4161	Resistor-Bleeder resistor(R46,R47,R48).....
32537	Socket-octal tube socket.....
S-3591	Transformer-Power 60-cycle (T1).....
S-3592	Transformer-Power 25-cycle (T1).....
S-3590	Transformer-Output (T2) (L40,L41).....
	MISCELLANEOUS ASSEMBLY
S-4424	Arrestor-Lightning arrestor.....
70788	Antenna-FM transmission line.....
38376	Bezel.....
38375	Button-Pushbutton.....
S-4017	Board-Ant.terminal board.....
S-4313	Cord-Drive cord (Universal).....
S-4167	Clamps-Back cover clamp (Pkg.10).....
S-4163	Cloth-Grille cloth.....
S-4162	Decal (front panel).....
36386	Decal (record drawer).....
S-3636	Grille-Metal speaker grille.....
S-4170	Gear-Drive gear.....
S-4171	Gear-Sleeve gear.....
S-4172	Grommet-Chassis mtg. (Pkg.3).....
S-4369	Hinge-Knife hinge for record album door.....
S-4028	Hinge-Invisible hinge for radio door.....
S-4026	Handle-Door handle.....
13103	Jewel-Indicator jewel.....
72147	Knob-Range.....
72148	Knob-Tone.....
72149	Knob-Tuning.....
72150	Knob-Volume.....
11765	Lamp-Pilot lamp (Mazda #51).....
31480	Lamp-Indicator lamp (Mazda #47).....
S-3948	Marker-Station marker.....
3118	Plug-Cable plug (3 pins).....
12567	Plug-Speaker cable (5 pins).....
S-4183	Plug-Power cable plug (7 pins).....
11984	Plug-Loop connector.....
4982	Spring-Range knob retaining spring (Pkg.5)....
14270	Spring-Tone knob retaining spring (Pkg.2).....
30330	Spring-Volume knob retaining spring (Pkg.3)...
30900	Spring-Tuning knob retaining spring (Pkg.5)...
30585	Spring-Drive cord tension (Pkg.2).....
34053	Spring-P.B. retaining spring (Pkg.5).....
31611	Screw-Set screw for gear #8-32x1/4 (Pkg.10)...
14278	Socket-Phono socket.....
5119	Socket-Cable socket (3 pins).....
12493	Socket-Speaker cable (5 pins).....
S-4164	Socket-Power cable (7 pins).....
S-4168	Support-Door fall support.....
	MAGIC MONITOR
70935	Capacitor-27 MMF 10% Ceramic (C108).....
71922	Capacitor-180 MMF 10% Ceramic(C103).....
71919	Capacitor-330 MMF 10% Ceramic(C101).....
S-4425	Capacitor-1000 MMF plus or minus 20%Ceramic(C107)
S-3646	Capacitor-.005 MFD(C102,C105,C106).....
70615	Capacitor-.05 MFD.(C104).....
14250	Resistor -8200 ohms,1/2 watt(R55).....
3219	Resistor-18000 ohms,1/2 watt(R60).....
30685	Resistor-33000 ohms,1/2 watt(R61,R62).....
30648	Resistor-470,000 ohmsk1/2 watt(R54,R57,R58)...
30652	Resistor-1 Megohm, 1/2 watt(R51,R52,R56).....
31417	Resistor-3.3 Megohm,1/2 watt(R59).....
30992	Resistor-10 Megohm, 1/2 watt(R53).....
S-4426	Socket-Tube socket.....
S-4202	Socket-Phono socket.....
	PULLOUT MECHANISM
S-4182	Door balancing assembly.....
S-4166	Spring-balancing spring.....
S-4027	Drawer Slide (1 set) (record player).....
S-4373	Roll out mechanism arm.....
S-4374	Roll out mechanism roller.....
S-4169	Hex nut-door balancing assembly.....
S-4176	Set screw (Pkg.3).....
S-4177	Spring washer (Pkg.3).....
S-4178	Stud.....
S-4180	Fibre Washer (Pkg.5).....

All parts and prices subject to change or withdrawal without notice.