RCA Victor

SERVICE NOTES

for

1936

Broadcast Radio Receivers

All-Wave Radio Receivers

Phonograph Combination Instruments

Miscellaneous Service Information

Service Division

RCA Manufacturing Company, Inc.

Camden, N. J., U. S. A.

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Broadcast Radio Receivers
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RCA Victor Service Notes

Year	*Stock No.*	*Year*	*Stock No.*
1923-28	100	1934	104
1929-30	101	1935	105
1931-32	102	1936	106
1933	103		

Net Price $1.25 Each, F. O. B. Camden, N. J., U. S. A.

Service Division

RCA Manufacturing Company, Inc.

Camden, N. J., U. S. A.

INTRODUCTION

The Instruction Books and Service Notes contained herein are for the radio receiver and phonograph combination models sold by the RCA Manufacturing Co., Inc., during the year 1936. This information has been compiled by the Service Division for RCA Victor Distributors and Dealers for use by their personnel in conjunction with the servicing and replacing of parts in the instruments listed.

Proper operation of any radio receiver is dependent upon correct service methods and replacement of defective parts. We earnestly recommend that you follow the instructions given, use the equipment recommended and replace defective parts with genuine RCA Victor Factory Tested Replacement Parts. Your Distributor will be glad to obtain any part or service equipment mentioned in this book and give you every possible assistance in the performance of your work.

First Edition

RCA Manufacturing Co., Inc.
Camden, N. J., U. S. A.

Printed in U. S. A.

TABLE OF CONTENTS

SHAKE, RADIO SERVICE ENGINEER

You are interested in servicing every kind of radio apparatus; RCA makes all kinds of radio apparatus and is interested in having it properly serviced. —You are interested in the stabilization of the radio service business. So is RCA. Everything that benefits radio in any of its branches benefits RCA. —Between you and RCA there is a natural partnership. You can depend on RCA to see things from your point of view —You can depend on RCA, as your partner, to support you in anything that benefits the radio service business in particular and the radio industry and the public in general. —You can depend on RCA to produce accurate Test Instruments designed for your needs and priced for your pocketbook. —You can depend on RCA for Replacement Parts for RCA Victor sets that are built with the same precision as the original parts. —You can depend on RCA to furnish you with complete technical information on its products. —You can depend on the RCA trademark making it easier for you to obtain customers and easier to keep them satisfied.

TEAM UP WITH RCA . . SEE YOUR RCA PARTS DISTRIBUTOR FOR

Test Equipment . . Oscillators . . Output Meters . . Special Tools . . Antenna Systems . . . Cathode Ray Test Equipment . . . RCA Victor Replacement Parts . . . Phonograph Modernization Kits . . . Auto Radio Locks

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC. — CAMDEN, NEW JERSEY

CONTENTS

1923-28

1929-30

1931-32

1933

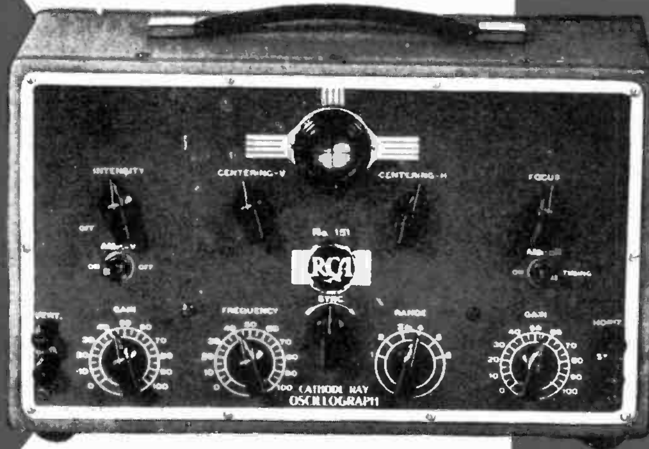
1934

1935

NEW RCA TEST EQUIPMENT

AT PRICES EVERY SERVICE ENGINEER CAN AFFORD

- Uses new RCA-913 Cathode Ray Tube. Built for every service application.
- High sensitivity—1.75 volts (RMS) for full-scale deflection.
- Vertical and horizontal amplifiers—Individual controls—Flat 30—10,000 cycles.
- Linear Timing Axis—Range 30—10,000 cycles.
- Small spot diameter, sharp focus—Individual centering controls.



RCA CATHODE RAY OSCILLOGRAPH

No. 151—Net Price 47^{50}
Complete with All Tubes

- Variable electronic sweep—1 to 40 kcs.—Sweep rate, 120 times per second—No flicker.
- Wide frequency range—90 kcs. to 32,000 kcs.—Fundamental frequencies.
- Internal 400-cycle, or external amplitude modulation.
- Large dial—4 inches in diameter—Indirect illumination—No parallax—Two vernier ratios, 2:1 and 5:1.
- High r-f output—0.25 volts—Negligible leakage—Three-step attenuator plus continuously variable control.

RCA ELECTRONIC SWEEP TEST OSCILLATOR

No. 150—Net Price 64^{50}
Complete with All Tubes

RCA RADIO TEST EQUIPMENT FOR EVERY PURPOSE RCA

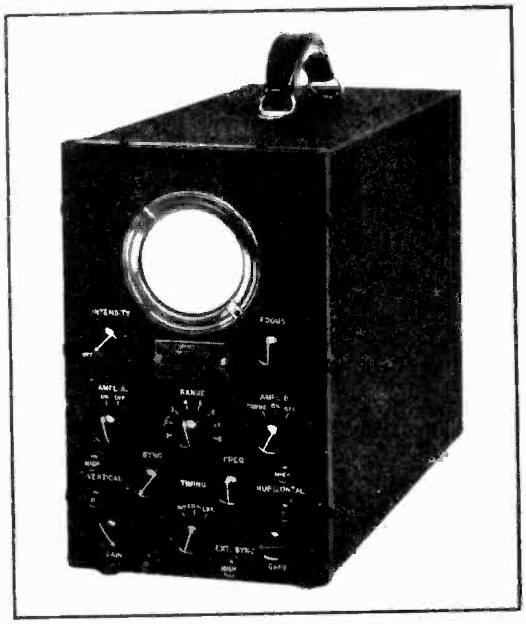
Complete . . Portable . . A-C Operated!

CATHODE RAY OSCILLOGRAPH

Stock No. 9545

NET PRICE

$84.50 *With RCA Tubes, Including RCA-906 Cathode Ray Tube*



Complete . . .

The RCA Cathode Ray Oscillograph, Type TMV-122-B, is complete in every essential requirement for immediate use. It includes two power supplies (one for the Cathode Ray Tube and one for the amplifier), vertical and horizontal amplifiers, saw-tooth frequency generator and six tubes, including the RCA-906 Cathode Ray Tube (3-inch).

.7 Volts (RMS) per Inch . . .

Through the use of two wide-frequency-range high-gain amplifiers, the sensitivity is guaranteed at 0.7 volts A. C. (RMS) per inch for both vertical and horizontal deflection. The amplifiers have flat frequency characteristics between 10 and 90,000 cycles ± 10 per cent. The amplifier gain is approximately 40.

10-18,000 Cycles . . .

A linear saw-tooth timing frequency oscillator with a special synchronizing circuit is an integral part of the RCA Oscillograph. The frequency range extends from 10 to 15,000 cycles and permits the examination of a single cycle up to 18,000 cycles or the examination of six cycles up to the limit of the amplifier—90,000 cycles. Suitable switching is provided so that either the internal timing oscillator or an external source of frequency may be connected to the plates through the amplifier. The binding posts may be connected directly to the plates for operation above 90,000 cycles with a sensitivity of 35 (RMS) volts per inch.

Beam Centering . . .

Two screwdriver adjustments are provided for centering the beam on the fluorescent screen. This may be required because of changes in geographical location or variations in tubes and circuit constants.

• For Service Engineers

Visual alignment of tuned circuits, "flat-topping" I. F. circuits, measuring hum and checking distortion in audio amplifiers are but few of the problems which are easily solved through the use of the RCA Cathode Ray Oscillograph. A visual presentation of practically all alternating current circuit functions may be quickly and easily made.

• For Amateurs and Experimenters

The RCA Cathode Ray Oscillograph enables the amateur to monitor percentage modulation, to check modulated waveform for distortion and examine the phase shift in audio amplifiers. Through its use the experimenter may easily and quickly arrive at the solution of the most difficult problem.

• For High Schools and Universities

Now every high school and university may easily give students the benefit of visual presentation of alternating current phenomena through the use of an oscillograph. Studies of alternating current wave shapes and demonstrations of the effects of changing constants in circuits may be quickly and easily made.

• For Radio Dealers

The RCA Cathode Ray Oscillograph gives the Radio Dealer an instrument for comparison of receiver characteristics and for making extremely effective window displays. Selling-up from a low-priced instrument to a higher-priced one is much easier when the eye as well as the ear can note the difference in performance.

• For Manufacturers

The RCA Cathode Ray Oscillograph is a valuable instrument either for receiver development or production testing. Better engineering and quicker and better tests are a direct result of its use in the manufacturing field.

A Quality Product from the RCA Parts Division

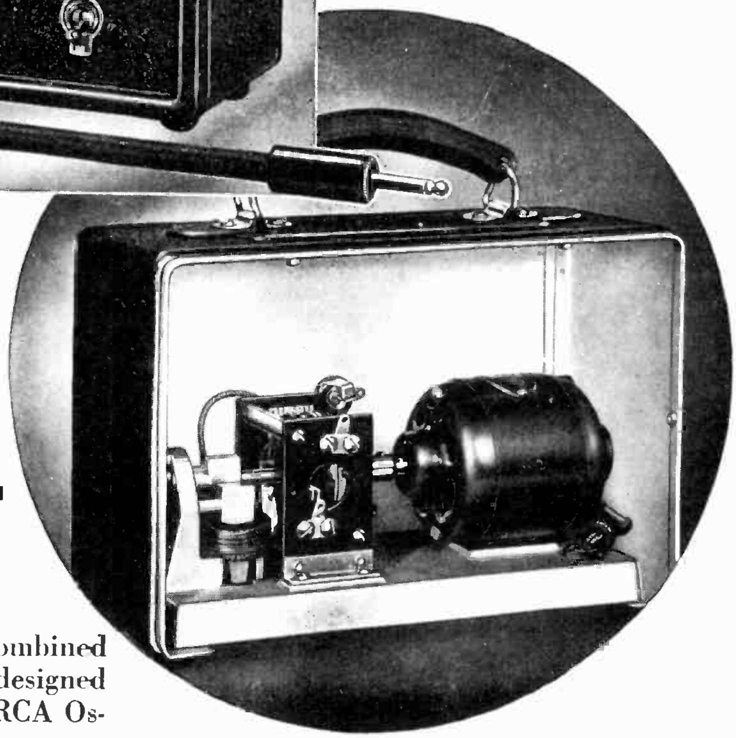
RCA Frequency Modulator

—FOR ALIGNING RECEIVERS WITH YOUR RCA OSCILLOGRAPH

$27.50

NET PRICE

STOCK No. 9558



- **LOW PRICE**
- **SMALL SIZE**
- **LIGHT WEIGHT**

THE RCA FREQUENCY MODULATOR is a combined motor-driven capacitor and a-c generator designed primarily for aligning circuits with the RCA Oscillograph and the RCA Test Oscillator.

For visual alignment of r-f and i-f circuits in superheterodyne radio receivers with an oscillograph, it is necessary to have an r-f signal of varying frequency connected to the circuit under test and to generate an a-c synchronizing voltage simultaneously with such frequency variation.

The three conditions necessary for visual alignment are:

✶ The unmodulated r-f signal frequency variation must slightly exceed the resonant frequency of the circuit under test.

✶ The variation of this unmodulated r-f signal must be at a greater rate than that discernible to the eye so that a flicker will not result.

✶ The r-f oscillator sweeping frequency must be synchronized with the horizontal "saw-tooth" sweeping frequency of the oscillograph.

The RCA Frequency Modulator and a test oscillator, such as RCA Test Oscillator Stock No. 9595, satisfy these three conditions.

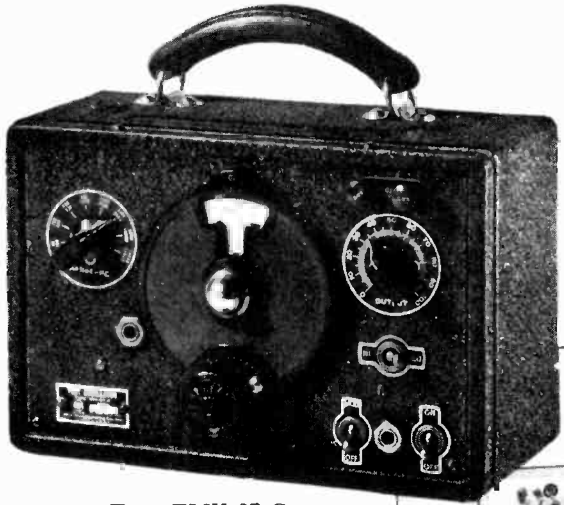
A QUALITY PRODUCT FROM THE RCA PARTS DIVISION

TEST OSCILLATOR

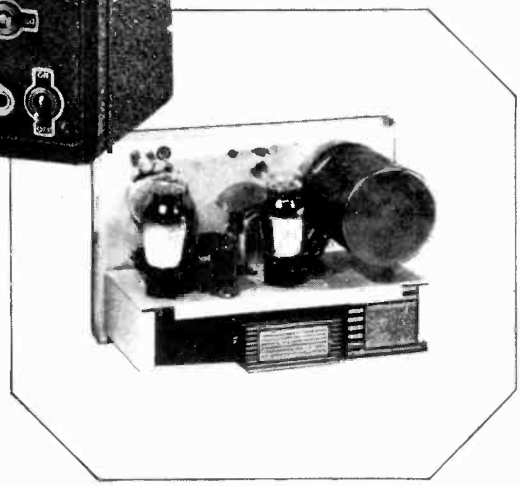
NET PRICE

$34.50

STOCK No. 9595



Type TMV-97-C



NEW
A
Laboratory Instrument for Service Engineers

No longer must you content yourself with a Test Oscillator having high leakage, poor calibration, unsymmetrical modulation or any of the usual undesirable features of most oscillators. The new RCA Test Oscillator overcomes these and all other features heretofore considered unavoidable in instruments of this type. While this new instrument retains the general appearance of its predecessors, its performance and flexibility have been improved to the point where it definitely gives laboratory type performance.

★ **90 KC. to 25,000 KC.** Frequency range covers all r-f and i-f alignment points of all receivers. Eight overlapping bands.

★ **High Output.** Check the table at the bottom of this page for the high output voltages available from this instrument.

★ **Low Leakage.** Copper shielding and scientific design give low leakage at the minimum output position.

★ **Oscillograph Jack.** Single circuit jack across tuning capacitor facilitates connection of Frequency Modulator for oscillograph operation.

★ **Frequency Meter.** Phone jack and switching gives operation as heterodyne frequency meter; useful for checking the unknown frequency of stations or oscillators.

COMPARE THESE R. F. OUTPUT VOLTAGES

Range—KC.	Switch at Low Position		Switch at High Position
	Minimum	Maximum	Max. Volts
	Less Than		
90– 200	1 Microvolt	2 Millivolts	0.2
200– 400	1 Microvolt	2 Millivolts	0.2
400– 800	1 Microvolt	2 Millivolts	0.2
800– 1500	1 Microvolt	2 Millivolts	0.2
1500– 3100	5 Microvolts	1 Millivolt	0.1
3100– 6800	10 Microvolts	1 Millivolt	0.1
6800–14000	20 Microvolts	1 Millivolt	0.1
14000–25000	40 Microvolts	1 Millivolt	0.1

FEATURES

FREQUENCY RANGE

The output frequency range extends from 90 KC. to 25,000 KC. by means of eight overlapping bands. This range covers all radio frequency and intermediate frequency line-up points of *all* receivers. The frequency range is covered entirely by the fundamental frequency of the oscillator, no harmonics being used.

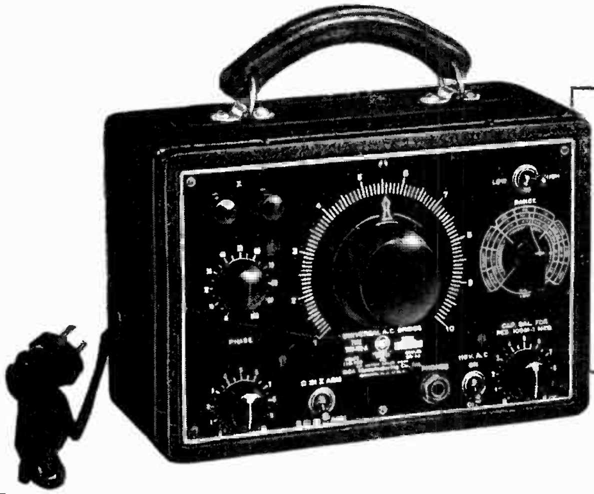
MODULATION

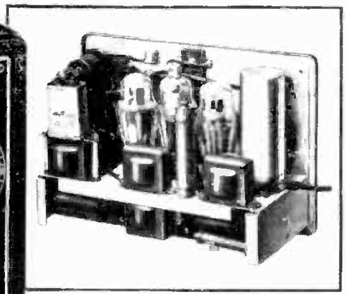
A separate tube modulates the radio frequency output with a 400 cycle sine-wave voltage. Compare on your oscillograph this modulation with your present oscillator. There is a panel switch for operating the oscillator either with or without modulation. A panel jack permits applying an external modulating frequency voltage such as a beat frequency oscillator or phonograph output to the R.F. signal.

Again ... RCA LEADS

WITH THE NEW ...

UNIVERSAL A. C. BRIDGE





STOCK NO. 9600

NET PRICE

$49.65

COMPLETE
With All Tubes and Standards

Speed up your work with this new RCA Universal Bridge. You can make accurate measurements (at 1,000 CPS) of the three basic properties of all electrical devices—inductance, capacity and resistance—quickly and easily. Has built-in precision standards.

MEASURES

- INDUCTANCE . . . **100 Microhenries to 10 Henries**
- CAPACITY . . **10 Micro-microfarads to 10 Microfarads**
- RESISTANCE . . . . **1 Ohm to 1 Megohm**

Accuracy . . . 5% Overall at Full Scale

for

SERVICE ENGINEERS
•
EXPERIMENTERS
•
LABORATORY WORKERS
•
MANUFACTURERS

The new RCA Universal Bridge is the latest item of Test Equipment offered by the RCA Parts Division for the simplification and quick analysis of service or laboratory problems. This bridge gives a quick and accurate check of inductance, capacity and resistance over extremely wide ranges. These ranges include the low values that ordinary resistance and capacity meters do not check. The only additional equipment needed is a headphone for use as a null indicator.

While many laboratories are able to make measurements of inductance, resistance and capacitance, very few are permanently set up to cover the extremely wide ranges of the RCA Universal Bridge. A small portable bridge, having such wide ranges with built-in standards, is an extremely useful piece of apparatus, regardless of other equipment available.

In the Service Field, the necessity for making measurements of inductance, capacity and resistance arises every day. The addition of the RCA Universal Bridge to a service engineer's equipment lessens his work and increases the accuracy of observations.

BEAT FREQUENCY OSCILLATOR

RANGE 30 - 15,000 CYCLES

NET PRICE

$64.50

COMPLETE WITH ALL TUBES AND POWER SUPPLY. STOCK No. 9633

Uses Four New Acorn Type Tubes

A variable frequency source of alternating current is a necessity for many radio service and laboratory uses. Fidelity measurements of receivers, loudspeaker testing, frequency measurements and many other applications are constantly requiring the use of a variable frequency A-C source.

The RCA Beat Frequency Oscillator is ideal for any application requiring a source of A-C of frequencies ranging from 30 to 15,000 cycles per second. Small, light in weight, and highly accurate, this unit incorporates design features found in only the highest priced laboratory oscillators.

Features of the RCA Beat Frequency Oscillator include the use of four RCA Acorn type tubes which greatly reduces space requirements and permits a more efficient component part arrangement. A neon lamp gives a quick means of checking the dial readings against the line frequency of 60 cycles—other checks may be made at 120 and 180 cycles. For 50 cycles, reference points will be 100 and 150 cycles. The direct reading dial is controlled by a 5 to 1 vernier drive which permits easy and accurate adjustments to any desired frequency.

The entire instrument is contained in the standard RCA Service equipment case, made of solid steel and finished in black crackle lacquer. The case is fitted with a leather handle and the entire instrument weighs only 10¾ lbs.

APPLICATIONS

Measuring Receiver Fidelity
Measuring Audio Amplifier Fidelity
Checking Transformer Frequency Characteristics
Checking Filter Frequency Characteristics
Making Frequency Measurements
Stroboscopic Speed Measurements
Testing Loudspeakers for rattles
Testing Radio Cabinets for howl

OUTPUT INDICATOR

Stock No. 4317

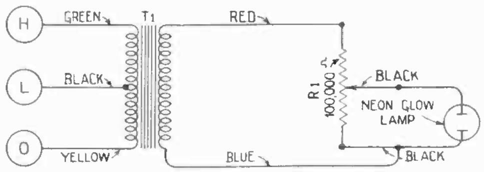
No Longer Need You "Peak" Receivers by Ear. Get an RCA Output Indicator

- High Sensitivity
- No burn-outs in normal use
- Has three impedances
- Use it on any receiver
- Sturdy and foolproof
- No delicate parts
- For use with any oscillator
- Attractive bakelite case

The RCA Output Indicator is a small, compact, visual output indicator designed for use with an oscillator when aligning radio receivers. The instrument consists of a tapped step-up transformer, a potentiometer, a glow tube and three binding posts for connecting the output of the receiver to the transformer. Three input impedances are available, namely, 0.6 ohm, 1.5 ohms and 4 ohms, which cover practically all receivers manufactured.

The instrument is used by connecting it across the leads of the input to the voice coil of the loudspeaker. The speaker may or may not be connected, as desired by the user. So connected, the glow tube will glow when a signal is impressed on the output indicator. The glow of this lamp is very sensitive, following variations in frequency and intensity. Naturally, this provides a very sensitive indicator for adjusting trimmer capacitors to their optimum position.

The entire mechanism is housed in an attractive die-cast bakelite case.



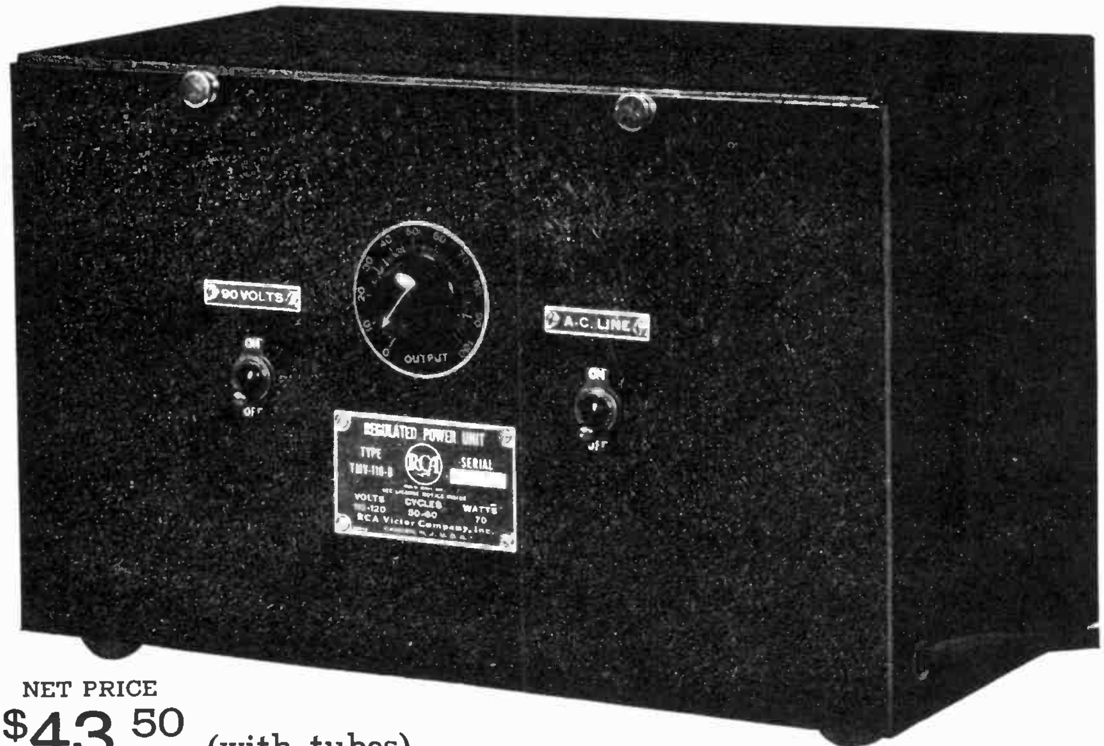
SPECIFICATIONS

Dimensions	5⅜" x 2⅞" x 2⅜"
Weight	13 Ounces
Case	Die-cast moulded bakelite
Lamp Rating	50–60 volts breakdown
Transformer Rating	80:1 (maximum)
Input Impedances	O to H, 4 ohms, O to L, 1½ ohms, H to L, .6 ohm
Potentiometer Resistance	100,000 ohms

NET PRICE $4.00

Regulated Power Unit

TMV-118-B



NET PRICE
$43.^{50}$ (with tubes)
F. O. B. CAMDEN, N. J.

A Constant Source of "B" Voltage

FOR

Designers, Development Laboratories, Electrical Laboratories, Experimenters, Engineers, Manufacturing Tests, Production Inspection, Physical Laboratories, School Demonstration Rooms, Scientific Service Organizations, Universities, etc., etc.

Supplies pure D. C. voltage without ripples . . . Automatically compensates for variation in load and in line voltage

Now You Can...

STUDY VIBRATION

Electrically

WITH THE

VIBRATION PICKUP

TMV-150-A

By means of the new RCA Vibration Pickup, any mechanical vibration or motion may be converted into electrical currents of identical characteristics. If this motion is recurrent in character, the resulting electrical currents may be presented visually on a Cathode Ray Oscillograph for study and analysis. The RCA Vibration Pickup, which functions through the piezo-electrical properties of a Rochelle Salt Crystal, is an instrument of great value to all physical, mechanical and sound laboratories. While the following list shows a few applications, many others will undoubtedly present themselves to all users.

STOCK NO. 9649
NET PRICE $20.00

USES

A few of the many uses of this instrument are:

1 Study of vibration of motors or parts of motors.
2 Study of vibration of remote units, such as control boxes.
3 Study of vibration of wings of aircraft.
4 Study of vibration of buildings and foundations.
5 Transmission of vibration through material.
6 Checking frequency and force of air hammers.
7 Locating components of machine causing noise.
8 Comparing relative smoothness of several surfaces.

SPECIFICATIONS

OUTPUT VOLTAGE—0.25 volt per .001 inch movement at 250 cycles. (See curve on reverse side.)

FREQUENCY RANGE—10-3000 cycles (approximately a square law curve).

VIBRATION AXIS—Right angles to face of pickup.

WEIGHT—8 ounces.

DIAMETER—3 inches.

DEPTH—1½ inches.

LENGTH OF CONNECTING CORD—8 feet.

Check your frequency

...ACCURATELY! WITH THE

RCA

PIEZO-ELECTRIC CALIBRATOR

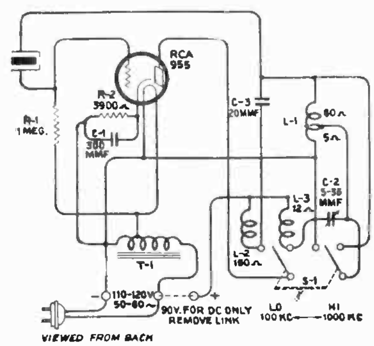
STOCK No. 9572

Give precision to your work by calibrating receivers, test oscillators and laboratory apparatus with the RCA Crystal Calibrator. It enables you to do a better job, guarantee the accuracy of your calibration and command a higher price for your work... A crystal oscillator, properly ground and accurately calibrated, maintains a more constant frequency than any other device known. The RCA Piezo-Electric Crystal Calibrator, which is a special crystal oscillator with two frequency modes, each having prolific harmonics, is an ideal standard for all accurate calibration work. Use it for better work.

NET PRICE **$29.95** COMPLETE WITH CRYSTAL, TUBE and POWER SUPPLY

CHECKS FREQUENCIES FROM:—

100 KC TO 20,000 KC IN 100 KC STEPS
1000 KC TO 50,000 KC IN 1000 KC STEPS
GUARANTEED ACCURACY 0.05 PERCENT OF 100 KC AND 1000 KC

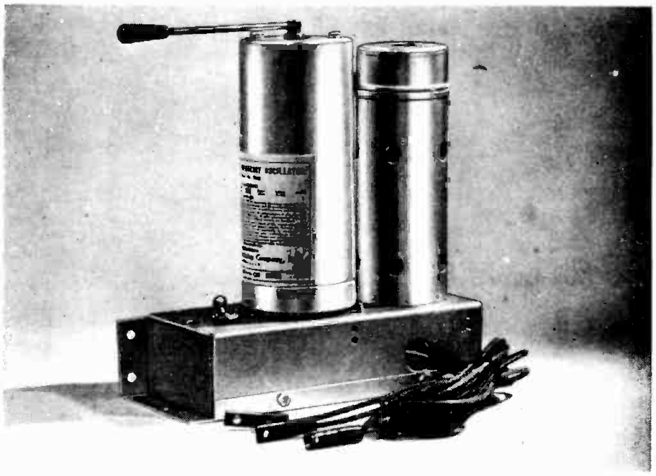


Schematic Diagram

INDIVIDUAL CRYSTAL CALIBRATION AND TEMPERATURE AT WHICH MADE, FURNISHED WITH EACH INSTRUMENT. ACCURACY—2 PARTS IN 1 MILLION.

Schematic diagram of RCA Piezo-Electric Calibrator showing values of parts and internal connections.

.. Listen to C-W Code Signals ..



With this instrument attached to a short wave superheterodyne home receiver, anyone can listen to the many continuous wave code signals that would otherwise be inaudible. Also useful for tuning any weak signal by the sensitive "birdie" method.

with this

RCA BEAT OSCILLATOR

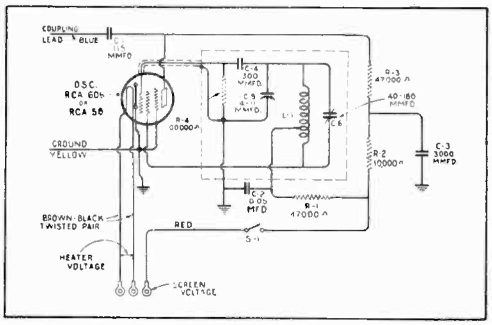
AND YOUR PRESENT SHORT WAVE RECEIVER

NET PRICE **$7.50** STOCK No. 9606

★ The RCA Beat Oscillator is a compact, un-modulated C-W oscillator having a frequency range from 415 kc. to 700 kc. It is designed to be used for the beat reception of continuous wave signals on either short wave or broadcast type receivers. Such reception is accomplished by the beat oscillator heterodyning the intermediate frequency signal, thereby creating an audio signal which is readily heard in the earphones or loudspeaker of any home receiver. A vernier adjustment, for controlling the frequency, or pitch, of the beat note, is fitted with a long handle, thus permitting fine adjustments. The oscillator may be operated with receivers using either 2.5-volt or 6.3-volt tubes, and is provided with easily attached terminals for obtaining plate and filament supply from the receiver.

Specifications

- ★ **CIRCUIT.** Electron-coupled, having excellent frequency stability.
- ★ **FREQUENCY RANGE.** 415 kc. to 700 kc.
- ★ **RADIOTRON REQUIRED.** 1 RCA-58 or 1 RCA-6D6 (not included).
- ★ **CONTROLS.** Fine frequency adjustment and "on-off" switch.
- ★ **SIZE.** Height, 7 inches; width, 2¾ inches; length, 7 inches. **WEIGHT:** 2 pounds.



Schematic Circuit Diagram

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC., CAMDEN, NEW JERSEY, U. S. A.

A miniature *Broadcast Station*

for every receiver...profits for Service Engineers!

SHOW YOUR customers how to broadcast records to themselves with the RCA Phonograph Oscillator. Possessing all the appeal of a distinct novelty, but with RCA practicability and durability built in, the RCA Phonograph Oscillator will prove popular with Service Engineers and receiver owners.

RCA Phonograph Oscillator

For the Service Engineer: For the Service Man the RCA Phonograph Oscillator does two things. It makes additional profits for him through the sale of additional equipment and solves one of his toughest problems in phonograph modernization work. The output from the pickup coil modulates the oscillator which is coupled to the antenna of the receiver. This modulated signal is tuned in on the receiver just like any broadcasting station.

Only a few minutes are required to attach the RCA Phonograph Oscillator. No struggle is involved to get the grid bias right; no circuit changes to make; no impedance matching. Just a few simple connections are necessary, for which directions are supplied with the equipment.

For the Receiver Owner: The RCA Phonograph Oscillator provides a miniature broadcasting station for every receiver-owning home. Its fidelity of record reproduction is limited only by the qualities of the receiver to which it is attached. It enables the owner to hear his favorite artists whenever he wants and as often.

With the rapidly reviving interest in record reproduction, and low-priced Bluebird records now within the reach of all, a tremendous field for profits awaits the alert Service Man.

This unit presents one more RCA profit maker for Service Engineers—one more trouble saver. Watch for the announcements of new, interesting, money - making, labor - saving devices that RCA Parts Division Engineers are developing now. Keep in touch with your RCA Parts Distributor.

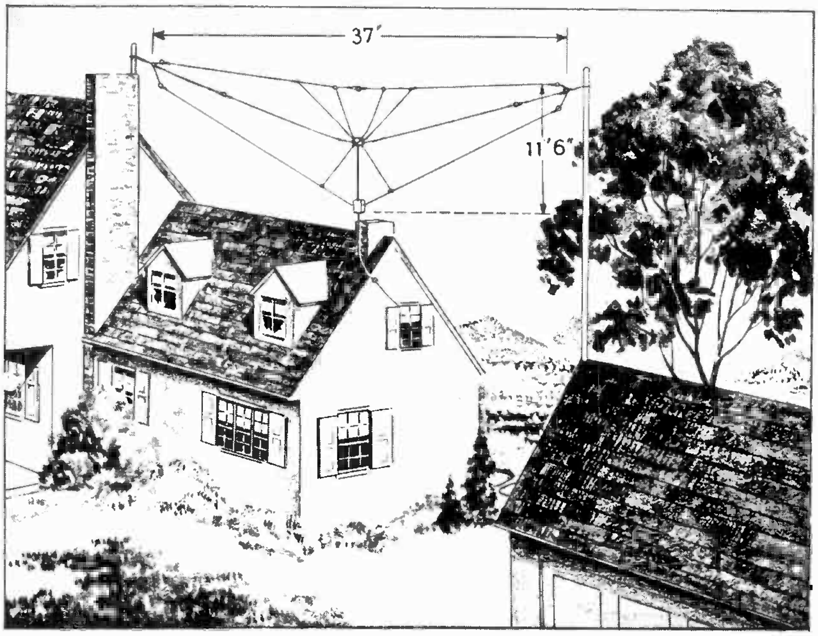
Stock No. 9554, List Price,* (*without tube*) *$9.75

ORDER FROM YOUR RCA PARTS DISTRIBUTOR

Another RCA Antenna Leader . . .

RCA SPIDER-WEB ANTENNA SYSTEM

. . . a transocanic communications type antenna for the home



List Price

$8.95

Stock No. 9685

Combining its experience in transoceanic communications work with its knowledge of home receiver requirements, RCA has produced a remarkable new antenna system. This antenna, which is known as the RCA Spider-Web Antenna, consists of a series of doublet antennas and an improved transmission line to the receiver. It is so constructed that additional doublets may be added to increase the frequency range to 70,000 K.C. (4 meters). More stations, less noise on the short-wave bands and an extremely wide frequency range are built-in characteristics of this remarkable new antenna.

Only with the RCA SPIDER-WEB ANTENNA *do you get all of these features . . . .*

- **FULL FREQUENCY COVERAGE**—The RCA Spider-Web Antenna System gives excellent signal pickup over the frequency range from 140 to 23,000 kc. By adding the Stock No. 9689 High Frequency Kit, List Price **$1.50,** the range is increased to 70,000 kc. with full noise reduction. This feature is especially important because of the increased frequency range of modern all-wave receivers. The high frequency kit may be added at any time, not necessarily when the antenna is first installed.

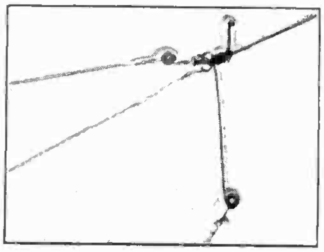
- **FACTORY ASSEMBLED**—Complete soldering and assembling make it possible to erect the antenna in a few minutes after providing supports.

- **SMALL SPACE REQUIRED**—A span of 38 feet and a vertical clearance of 12 feet are the entire space requirements of the RCA Spider-Web Antenna. You'll find it easy to install in almost any location. Because double-supports are eliminated, it is considerably easier to install than the former double-doublet antenna systems.

- **LESS NOISE**—The balanced doublets and transposed transmission line eliminate all pickup on the lead-in in the short-wave bands. This greatly reduces man-made static (noise) from automobiles and electrical devices that mar short-wave reception.

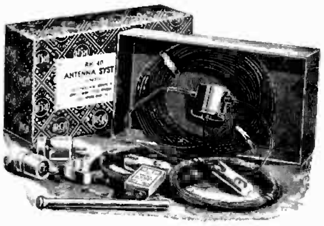
- **MORE STATIONS**—A multiple doublet of unique design insures greater signal pickup in every receiving band. You'll hear many stations not previously heard.

- **STURDY CONSTRUCTION**—Use of seven-strand No. 22 wire and a truss-type mechanical design insures the strength necessary to withstand severe winter weather disturbances, including heavy ice formation. The illustration shows one of these installations at Camden, N. J., during the severe winter of 1936.



OTHER RCA ANTENNA SYSTEMS

RCA RK-40 and RK-40A ANTENNA

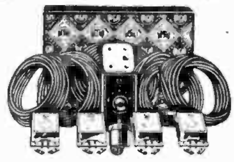


RK-40—**$5.75**
RK-40A—**$5.00**

The new RCA RK-40 and RK-40A Antenna are simplified antenna systems designed to reduce the time and labor required for antenna installation in the most difficult of locations. It is merely necessary to attach each end to supports and make connections to the receiver. The time and money saved by installing this easily erected antenna means more business and more profits for you. The low price enables you to sell it to customers of more modest incomes. RK-40—Stock No. 9631—For all receivers. RK-40A—Stock No. 9631A—For 1937 RCA Victor receivers. Does not have receiver coupling unit. Otherwise same as RK-40.

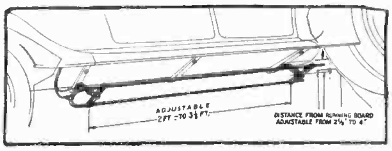
RCA DE LUXE STORE ANTENNA

The RCA De Luxe Store Antenna reduces man-made static on both short-wave and standard programs, besides picking up weak foreign stations seldom heard on ordinary antennas. By means of a unique switching arrangement, the antenna may be instantly connected to any one of four receivers merely by rotating a selector switch knob.



Net Price **$10.80**
Stock No. 9580

RCA DI-POLE AUTO ANTENNA



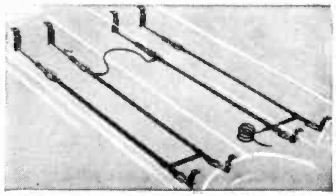
Stock No. 9605
List Price **$2.60**

The RCA Di-Pole Auto Antenna is an entirely new development in automobile antenna design. It's easily and quickly installed on any car, gives efficient pickup from stations, and eliminates all ignition-noise pickup by the antenna. It gives excellent results on the new metal top cars and older cars not having roof antennas. Recommend it to your customers.

THE INLANTENNA

UNIVERSAL TYPE
All Cars except Oldsmobile
Stock No. 12322
List Price **$5.50**

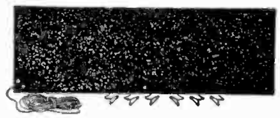
OLDSMOBILE TYPE
Oldsmobile Cars Only
Stock No. 12328
List Price **$6.00**



The Inlantenna is a high quality, double running board type auto antenna, especially desirable for installing in metal top cars at locations where broadcast signals are generally weak. It is easily installed, comes complete with all fittings and is furnished in two types as listed. The Inlantenna is an ideal accessory to sell with all auto radio installations. Build up your volume with this accessory.

RCA AUTO ROOF ANTENNA

For use in cars which have no built-in antenna or when the factory-installed antenna does not give satisfaction. Makes a neat job at small expense. Easily installed, being simply pinned to the inside fabric of the car roof with six safety-pin type fasteners that come with the antenna. Size 11 inches by 32 inches.



List Price **$1.50**
Stock No. 7622

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC., CAMDEN, NEW JERSEY, U. S. A.

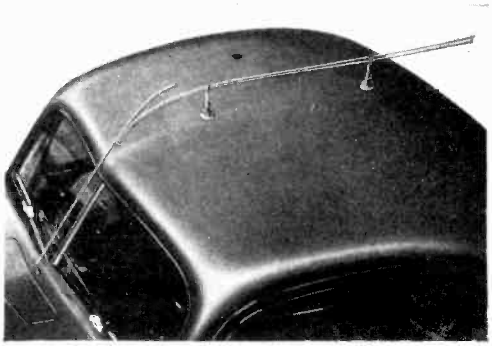
An RCA Service

AUTO ANTENNAS AND ACCESSORIES

RCA AUTO-TOPTENNA

LIST PRICE $5.00

Stock No. 9792



FEATURES

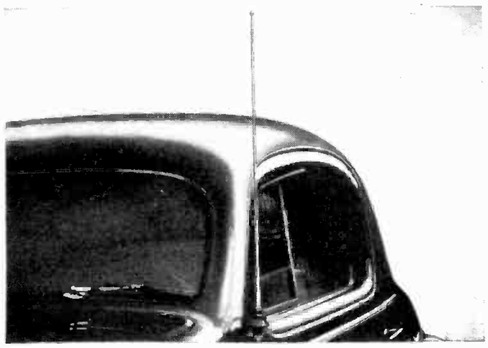
1. Fits all cars (coupes, coaches, sedans)
2. Simple installation—no drilling in steel top
3. Streamline design adds beauty to any automobile
4. Triple-chromium plated. Molded bakelite insulators
5. Can be removed without mutilating car. (Chromium button furnished to restore cowl if antenna is removed from car).
6. Eliminates wheel static and motor noise
7. Special cement furnished for suction cups
8. Installations not affected by climatic conditions

A special shielded fitting is included to cover the inside terminal of the RCA Toptenna. This insures perfect shielding and prevents the possibility of noises being picked up by the antenna terminal inside of the cowl.

RCA AUTO-RODTENNA

LIST PRICE $3.50

Stock No. 9793



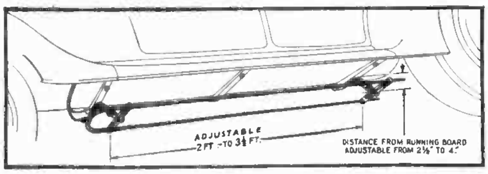
FEATURES

1. Quick installation—usually less than 5 minutes. No drilling required
2. Attaches to hinge pin of any car
3. Triple-chromium plated with molded all-weather rubber insulation. Attractive in appearance
4. Extremely efficient for maximum signal pickup
5. Eliminates wheel static and motor noise
6. One model fits all cars
7. Extremely flexible—guaranteed not to break

EASE OF INSTALLATION

It is merely necessary to remove the hinge bolt on either side of the car, attach the RCA Rodtenna, and return the bolt for a complete installation. No drilling or cementing to top necessary. Lead-in goes through door opening.

RCA DI-POLE AUTO ANTENNA LIST PRICE $2.60

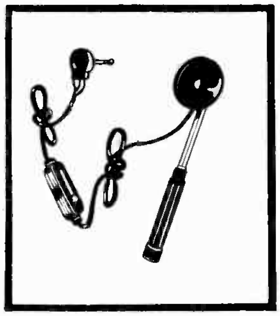


Stock No. 9605

The RCA Di-Pole Auto Antenna is an entirely new development in automobile antenna design. It's easily and quickly installed on any car, gives efficient pickup from stations, and eliminates all ignition-noise pickup by the antenna. It gives excellent results on the new metal top cars and older cars not having roof antennas. Recommend it to your customers.

DEMONSTRATE THESE AIDS . . .

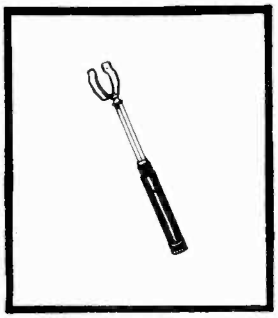
to your Hard-of-Hearing Prospects



STOCK NO. 9754

RCA Sonotone Air Conduction Unit—A diaphragm type unit, held to the ear by means of a lorgnette handle. For those who can use or prefer the air conduction type of hearing aid. Complete with handle.

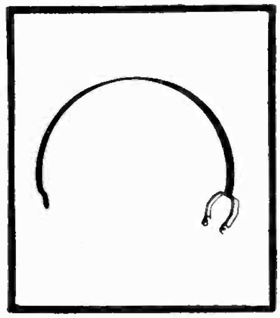
List Price $25.00



STOCK NO. 9752

RCA Sonotone Lorgnette Handle—A beautiful black and gold-plated unit of adjustable length from 4¼ inches to 6⅞ inches. For holding the RCA Sonotone Bone Conduction Unit.

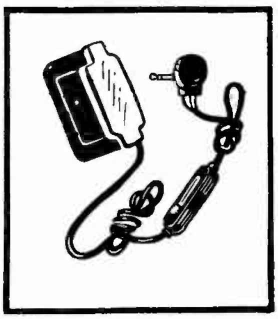
List Price $4.00



STOCK NO. 9753

RCA Sonotone Headband—An inconspicuous headband for holding the Bone Conduction Unit. Enables one to have both hands free for other activities.

List Price $1.00



STOCK NO. 9751

RCA Sonotone Bone Conduction Unit—A scientific unit which, when held against the bone behind or in front of the ear, transmits the program by means of vibration direct to the auditory nerve, thereby enabling those with defective ear drums to hear satisfactorily. Complete with Sliding Type Volume Control.

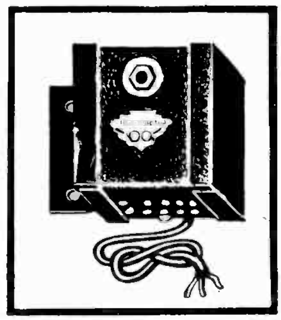
List Price $21.00

Order from

YOUR

RCA PARTS

DISTRIBUTOR



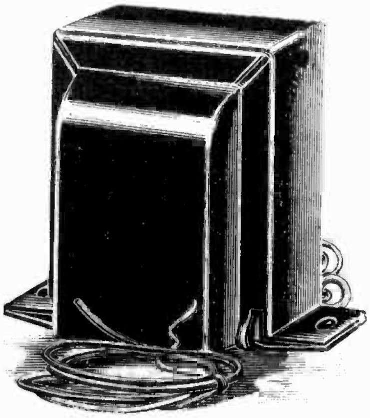
STOCK NO. 9715

RCA Earphone Adapter—A special unit complete with 36-inch cable and terminal block for attaching to the voice coil of any radio set. Matches the impedance of the Sonotone units (40 ohms) to that of the voice coil. Has three positions—one for radio alone, one for both Sonotone and radio, and one for Sonotone alone.

List Price $3.50

RCA UNIVERSAL AUDIO TRANSFORMER

for interstage audio transformer replacements in all radio sets and power amplifiers



STOCK NO. 9632
LIST PRICE **$2.00**

Now, with the new RCA Universal Audio Transformer, you can make all interstage transformer replacements with a single unit. No need to carry more than this one transformer for any job that may occur. It contains a center tapped primary and a center tapped secondary for connecting either from or to any single or push-pull stage. Has proper step-up ratio and is easily and quickly mounted on any type of chassis.

SPECIFICATIONS

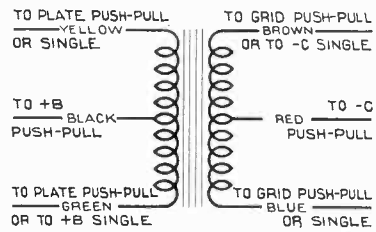
OVERALL SIZE—2" x 2⅜" x 2⅞"—Shielded black finished case—Vacuum wax impregnated.

FREQUENCY RESPONSE—30—10,000 cycles.

TURN RATIO—Primary to Secondary 1:3 overall.

PRIMARY CURRENT—10 milliamperes D.C. (maximum).

PRIMARY CONNECTIONS—Primary connects to any single or push-pull triode, such as O1A, 26, 27, 30, 37, 55, 56, 76, 85, 6C5 or others of similar plate impedance. Secondary, to any single or push-pull stage regardless of tube type.

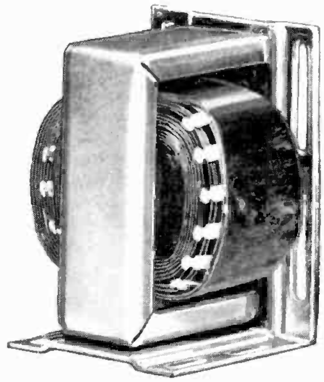


CONNECTION DIAGRAM

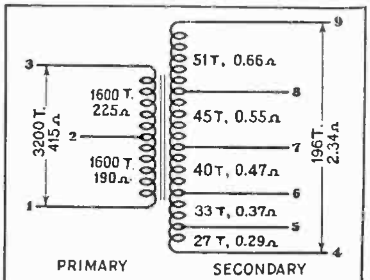
RCA UNIVERSAL OUTPUT TRANSFORMER

for output transformer replacement in all sets

- One transformer for exact matching of all output tubes (either single or push-pull) to all dynamic loudspeakers. (Covers voice-coil impedances from 1 ohm to 15 ohms.)
- Universal mechanically as well as electrically. Angle bracket with slots for easy mounting on either chassis or loudspeaker frame.
- Silicon steel core eliminates possibility of damage from mechanical shock or from temporary electrical overload.
- Tinned soldering terminals for quickly attaching tube and speaker leads.
- Baked varnish impregnation gives protection against normal climatic conditions.



Stock No. 7852
List Price **$2.00**



CONNECTION DIAGRAM

SPECIFICATIONS

Size—Standard Model—2¾" x 2¼" x 2".
Cased Model—2¾" x 2⅜" x 3".
Voice Coil Impedances—1 to 15 Ohms.
Primary Load Impedances—1,000 to 20,000 Ohms.
Maximum Working Potential—500 Volts.
Maximum Plate Current (each tube)—55 Milliamperes.
Frequency Range—30 to 10,000 Cycles.

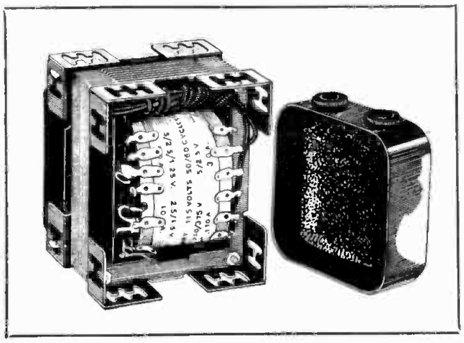
TROPICAL MODEL

A special impregnated model in a shielded case gives absolute protection under severe tropical conditions.

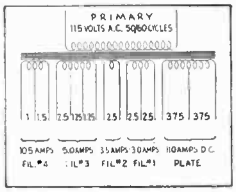
Stock No. 7853
LIST PRICE **$2.35**

UNIVERSAL POWER TRANSFORMERS

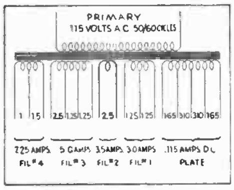
FOR SETS USING BOTH 6.3-VOLT AND 2.5-VOLT TUBES



Now service engineers can install true RCA quality in replacement power transformers for almost any make or model of a-c set manufactured to date and do so from a stock of only four transformers. The new line of four types of RCA Universal Power Transformers is priced surprisingly low, yet has really universal mounting brackets, removable end-bells, wide range of windings and is truly universal both electrically and mechanically.



Stock No. 9551
List Price **$5.50**



Stock No. 9552
List Price **$6.00**

FOR 10-12-TUBE SETS

A heavy-duty transformer capable of handling the largest of standard receivers. Heavy core, high voltage plate winding, removable end-bells and rugged construction make this a transformer capable of meeting all severe requirements.

FOR CLASS B SETS

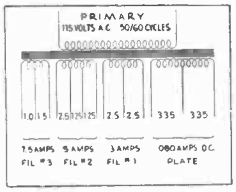
Exceptionally high (475/475) voltage plate winding and high current carrying capacity make this a transformer suitable for Class "B" output amplifiers. Good regulation and RCA features make this an exceptional value.

FOR 5-9-TUBE SETS

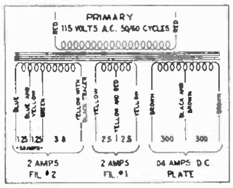
The most popular of the RCA Universal Transformers because it fits the greatest number of receivers. A quality transformer you can use on receivers of many types and manufacture. Works on both 2.5 volt and 6.3 volt sets.

FOR 4-TUBE SETS

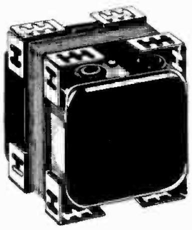
A high quality small transformer for midget four-tube receivers. Incorporates the high quality features needed for a transformer of this type. Has good regulation and minimum size. Connections made with long leads.



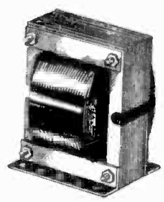
Stock No. 9553
List Price **$4.75**



Stock No. 9556
List Price **$2.00**



Stock Nos. 9551, 9552 and 9553



Stock No. 9556

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC., CAMDEN, NEW JERSEY, U. S. A.

An RCA Service

You can save *time* and *money*

RCA Cabinet Refinishing Kit

YOU won't call in the cabinet refinisher nearly so often after you get the RCA Cabinet Refinishing Kit. Of course you can't do every refinishing job with it, but you can do most of them—saving time and money on every job. It's the little touch-up jobs that occur most often anyhow. Someone in the shop lays a hammer on the cabinet; a button on the truck driver's coat scratches it in delivery; or perhaps it has been marred in home demonstrations or while on display in the dealer's store. But whatever the cause, you have the remedy at hand for use.

- 1 Can Refco Oil
- 1 Can Valvoline
- 1 Can Tripoli
- 1 Assortment Sand Paper
- 1 Assortment Stick Shellac
- 2 Pkgs. Aniline Stain Powders
- 1 Touch-up Brush
- 1 Spatula
- 1 Rubbing Block
- 1 Instruction Sheet

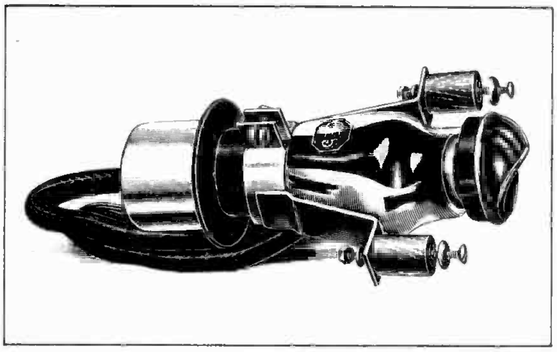
The RCA Cabinet Refinishing Kit does not contain all the material you will need for every job. For example, it does not contain lacquer, or a lamp for heating the spatula. But things like that are obtainable anywhere. Only the hard-to-obtain things have been included; the items you would have to run all over town to get, if obtainable at all.

Packed in a durable leatherette case, measuring 9½" x 4½" x 2¼", it opens like a purse. Stock No. 9546. Net to Service Engineers $2.90.

ORDER FROM YOUR RCA PARTS DISTRIBUTOR

Now . . .

an RCA CATHODE RAY TUNING INDICATOR



for all receivers

List Price

$3.00

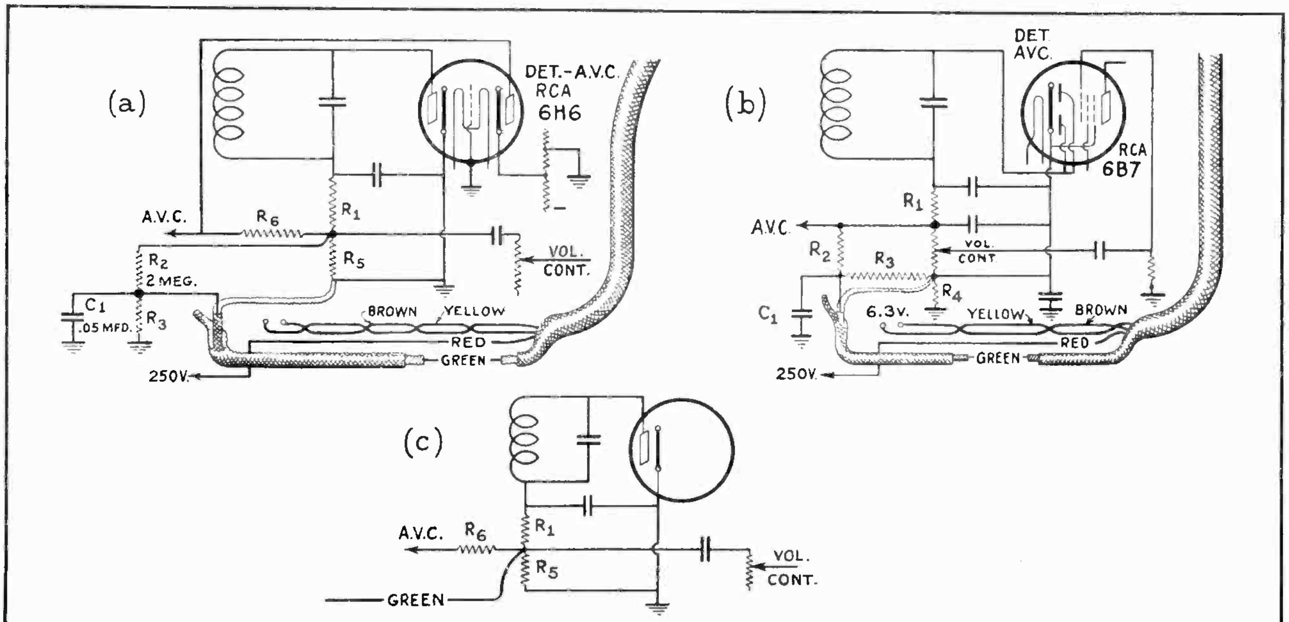
STOCK NO. 9688

Contents of Kit

1 RCA 6E5 Electron-Ray Tube
1 Socket complete with 24-inch cable
1 Tube mounting clamp and bracket assembly
1 Eye-Type escutcheon
2 Mounting bushings
2 Mounting screws complete with nuts and washers
1 Clamp screw complete with nut and lock washer
1 Rubber gasket

Now you can install a genuine RCA Cathode Ray Tuning Indicator, just like the famous RCA Magic Eye, in almost any receiver having an automatic volume control. By means of this complete kit of parts, installation work is but a matter of moments—just drill one hole, install three screws and make a few connections.

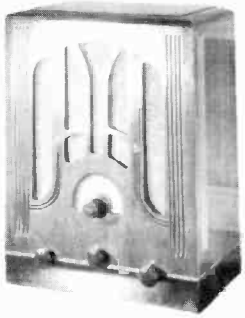
Always carry an RCA Cathode Ray Tuning Kit to show to your customers. You'll make a sale almost every time because everybody wants one. Ask your RCA Parts Distributor for details of this and other RCA money-making accessories.



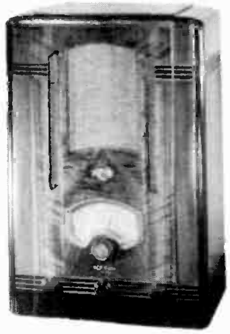
TYPICAL CONNECTIONS OF RCA CATHODE RAY TUNING KIT

TABLE MODELS

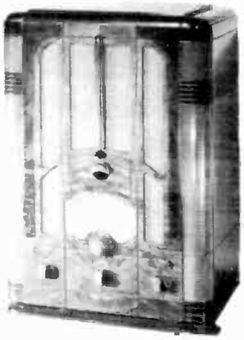
MODEL T 6-7



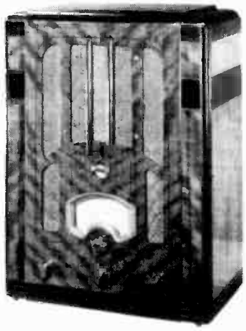
MODEL T 6-11



MODEL T 7-12



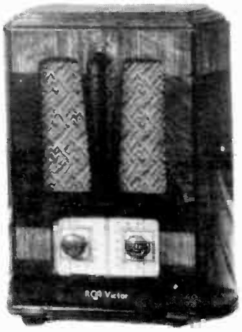
MODEL T 8-13



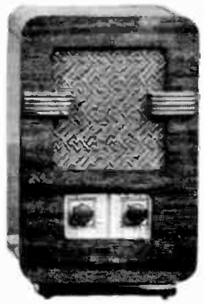
MODELS T 9-7 & T 9-8

MODEL T 9-10

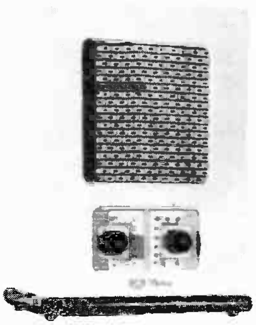
MODEL 4T



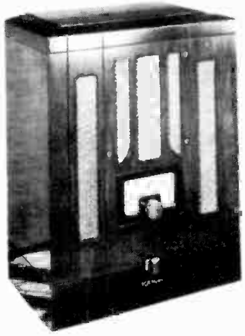
MODEL 4X



MODEL 4X3



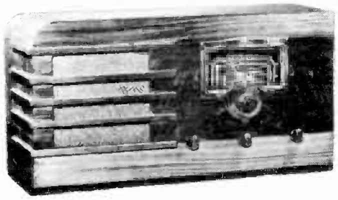
MODEL 4X4



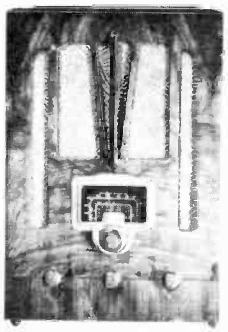
MODEL 5BT

MODEL 5T

TABLE MODELS

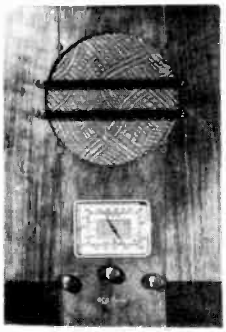


MODEL 5T4



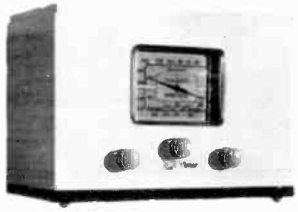
MODEL 5T5

MODELS 5X & 5XA



MODEL 5X2

MODELS 5X3 & 5XA3

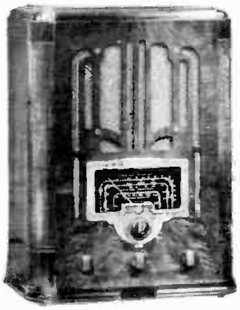


MODELS 5X4 & 5XA4

MODELS 6BT, 6BT6, & 6T

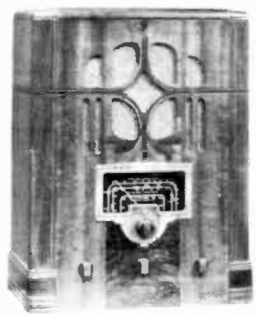
MODEL 6T2

MODEL 6T10



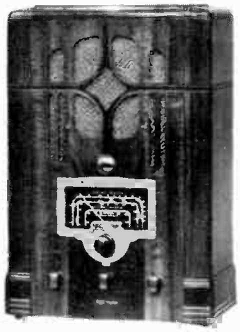
MODELS 7T & 7X

MODEL 7X1

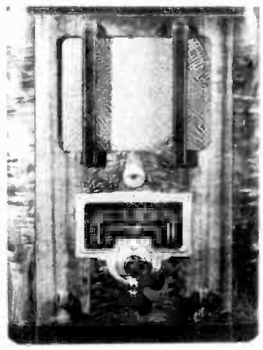


MODELS 8BT & 8BT6

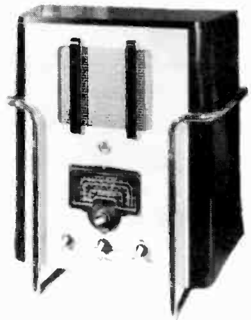
TABLE MODELS



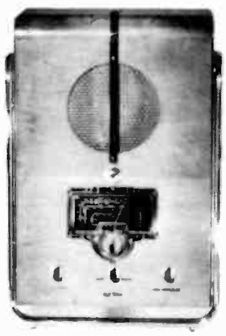
MODEL 8T



MODEL 8T2

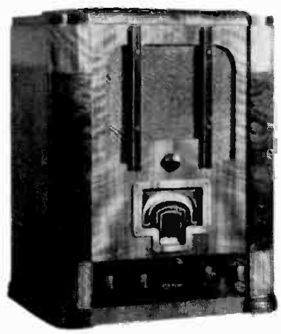


MODEL 8T10

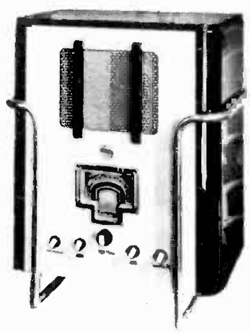


MODEL 8T11

MODEL 9T

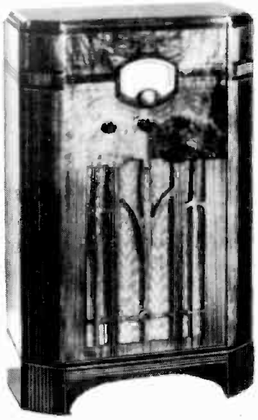


MODEL 10T

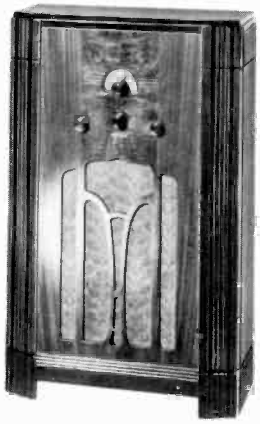


MODEL 10T11

CONSOLE MODELS



MODEL C 6-8



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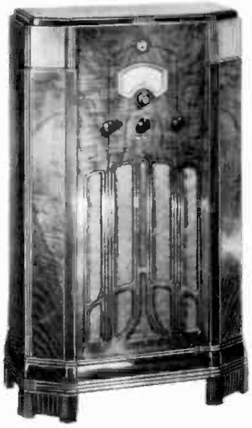
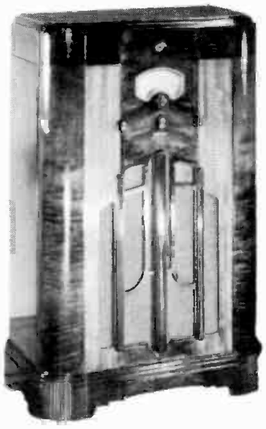


MODEL C 7-14

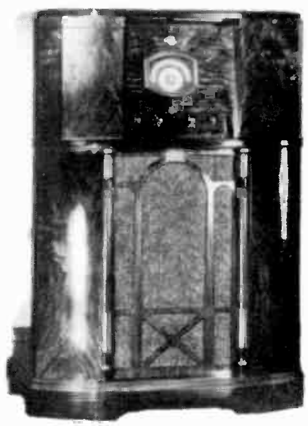


MODEL C 8-19

MODEL C 8-20

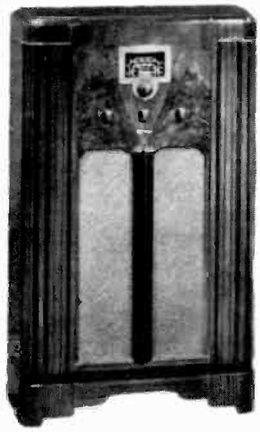
MODEL C 11-3

MODEL C 13-3

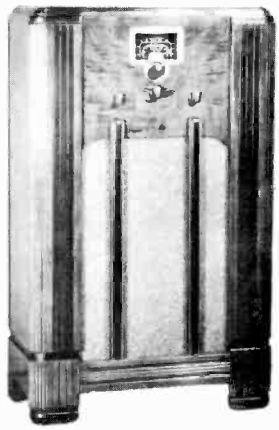


MODEL C 15-4

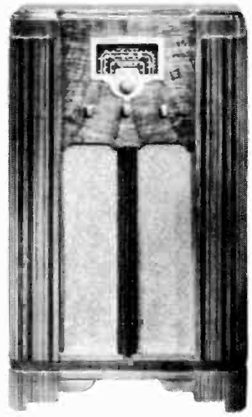
CONSOLE MODELS



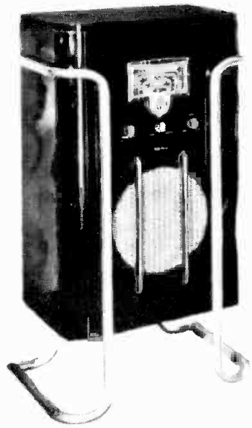
MODELS 6BK & 6BK6



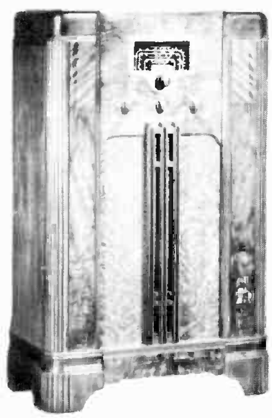
MODELS 6K & 6K1



MODEL 6K2



MODEL 6K10



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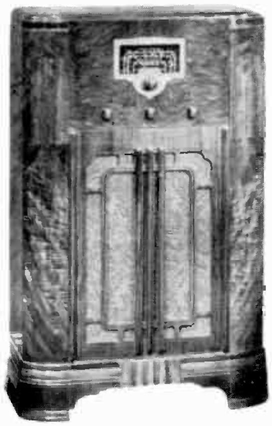
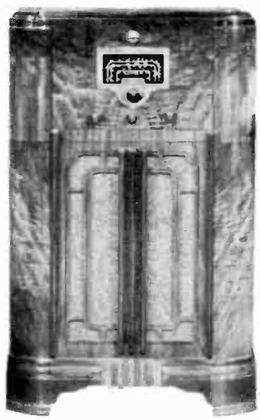


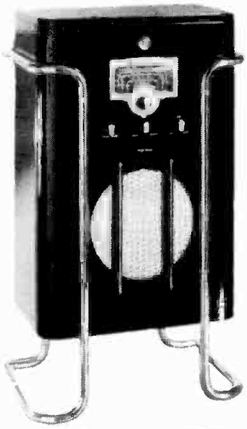
MODELS 8BK & 8BK6



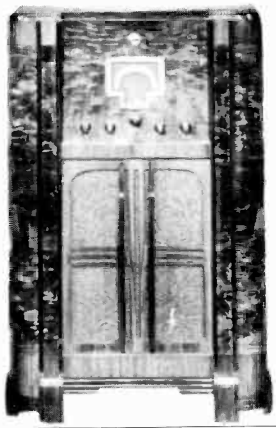
MODEL 8K

MODEL 8K1

CONSOLE MODELS

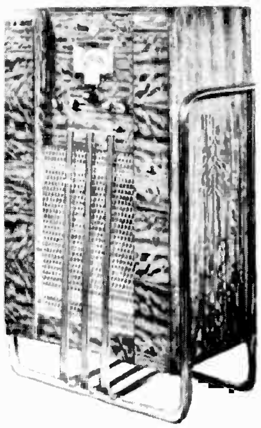


MODEL 8K11

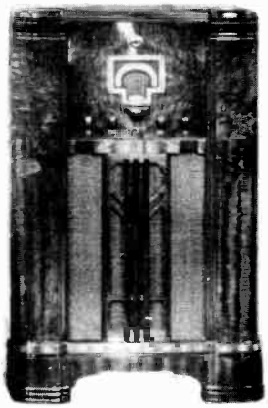


MODEL 9K

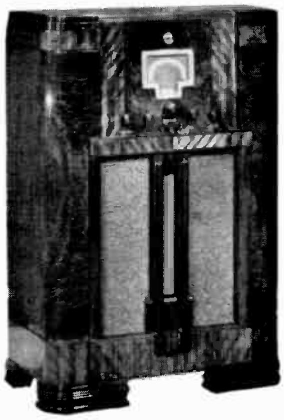
MODEL 9K2



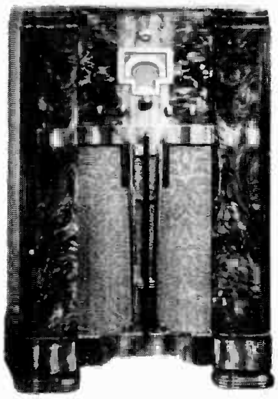
MODELS 9K10 & 10K11



MODEL 10K

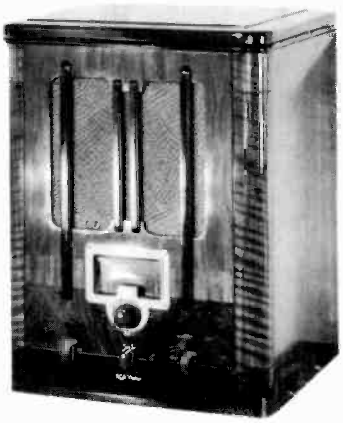


MODEL 13K

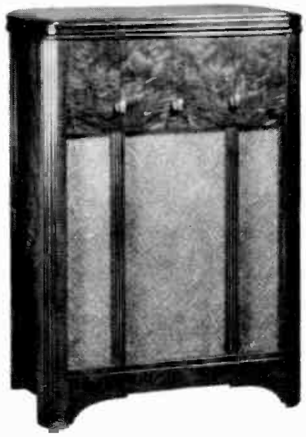


MODEL 15K

RADIO-PHONOGRAPH COMBINATIONS



MODEL 5U

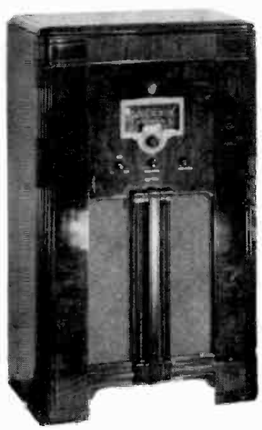


MODEL R-99

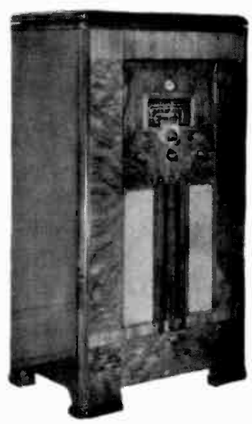
MODEL D 8-28

MODEL 9U

MODEL 7U

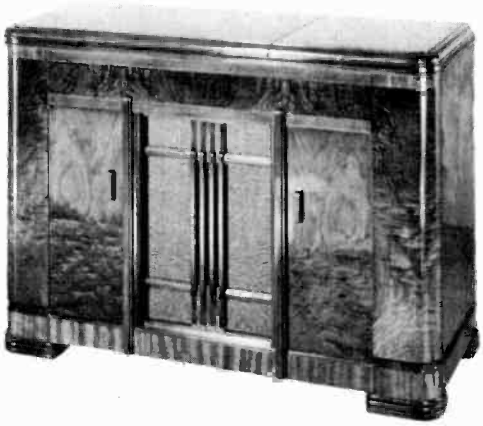


MODEL 7U2

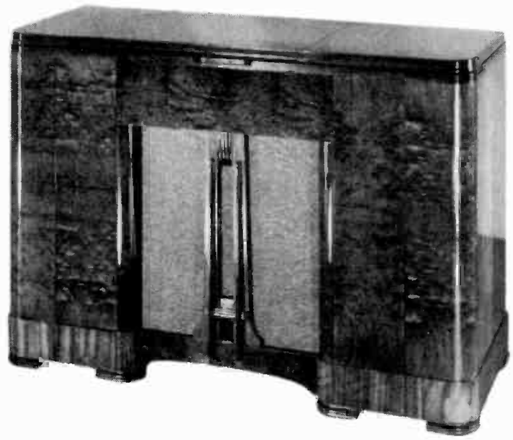


MODELS 8U & 8U2

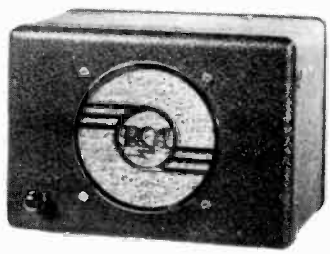
RADIO-PHONOGRAPH COMBINATIONS
AUTOMOBILE RECEIVERS AND AMATEUR RECEIVER



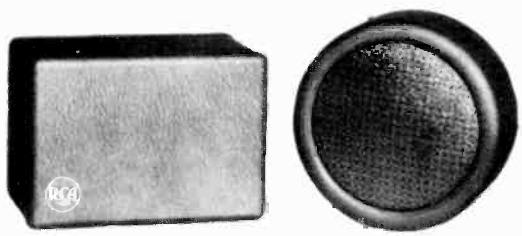
MODEL 9U2



MODEL 15U

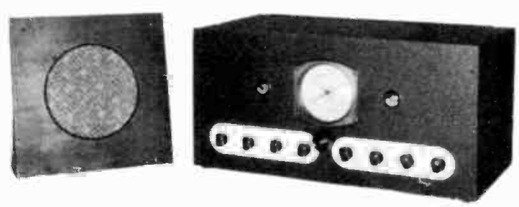


MODELS 5M & 6M



MODEL 6M2

MODEL 0-1



MODEL ACR-175

NOTICE

ALL PRICES QUOTED IN THIS BOOK ARE SUBJECT TO CHANGE WITHOUT NOTICE

INSTRUCTION BOOK
for the
ACR-175

PART I—INTRODUCTION

1. General

This new Amateur Receiver covers a range of 500 to 60,000 kilocycles and is adapted for c-w reception. It embodies the latest features of design and construction including: the most reliable and stable circuits; new metal tubes; calibrated beat-frequency oscillator; crystal filter; and sensitivity control, with calibrated indication of signal input when used in connection with the electron-ray-tube tuning indicator. The sensitivity and selectivity of this instrument, together with its frequency stability and reliability, open to the listener an actual field of reception covering practically all communications available on the air.

This book should be studied carefully, so that you may learn how to make full use of this instrument and keep it in its optimum operating condition.

2. Special Features

The use of the most recent dependable electrical developments in receiver design are evident from an inspection of the schematic circuit diagram (Fig. 3,) and the chassis wiring diagram (Fig. 6). The *new metal tubes* provide particularly effective shielding as well as minimum terminal spacing and short connecting circuits.

Nine controls on the front of the instrument give complete front panel adjustment. The *Calibrated Sensitivity Control* or *Signal Input Control* provides for direct measurement of input signals in terms of an absolute value, the microvolt, thus affording a means of giving accurate signal strength reports. An *AVC Switch* allows one to dispense with the use of the *Automatic Volume Control* when desired. The *Tuning Control* operates on reduction ratios of 20:1 and 100:1, enabling one to make either rapid or unusually fine adjustments for precise tuning. The *Crystal Filter* in the first i-f stage provides single-signal reception with an unusually high degree of selectivity. The adjustable *Selectivity Control* is a means of obtaining various degrees of selectivity with or without a rejection dip. The *Electron-Ray-Tube Indicator* fulfills the dual function of measuring signal input and aiding in precise tuning.

The *Beat Oscillator* is equipped with two controls, an "on-off" switch and a calibrated *Heterodyne Control* with induction tuning, which effectively governs the pitch. The shield enclosing the entire beat-oscillator circuit enables the listener to operate the set with freedom from undesirable beat notes due to harmonics. Code messages and other continuous wave transmissions, as well as modulated signals of very low strength and those with the carrier not modulated continuously, are all clearly brought through by proper manipulation of the beat oscillator controls.

Each instrument is carefully tested and calibrated before leaving the factory.

The *Loudspeaker* is a separate unit attached to the chassis by means of a cable with a six-prong plug-in connection. It is mounted on a small baffle with easel supports. Holes are provided for mounting on a larger baffle when high-quality reproduction is required.

PART II—ELECTRICAL SPECIFICATIONS

3. Tuning Range

Band Letter	Band Limits			Band Services
	Kilocycles	*Megacycles*	*Meters*	*Major Transmissions*
A	500–1,690	0.5–1.69	600–176	Ships—Standard Broadcast
B	1,690–6,200	1.69–6.2	176–48.4	160 and 80 m. Amateur—Police—Aviation
C	6,200–15,450	6.2–15.45	48.4–19.6	40 and 20 m. Amateur—S-W Broadcast
D	15,450–60,000	15.45–60	19.6–5	10 and 5 m. Amateur—Police—S-W Broadcast

4. Circuit Data

Circuit.—Superheterodyne with beat-frequency oscillator for c-w reception, crystal filter, automatic volume control, electron-ray indicator with calibrated signal input (sensitivity) control, and class A pentode output system.

Intermediate Frequency.— (includes crystal resonator)—460 kilocycles.

Power Output.—2 watts (undistorted); 4½ watts maximum.

Loudspeaker. — (separate unit) — Electrodynamic 8-inch (voice-coil impedance 2¼ ohms at 400 cycles).

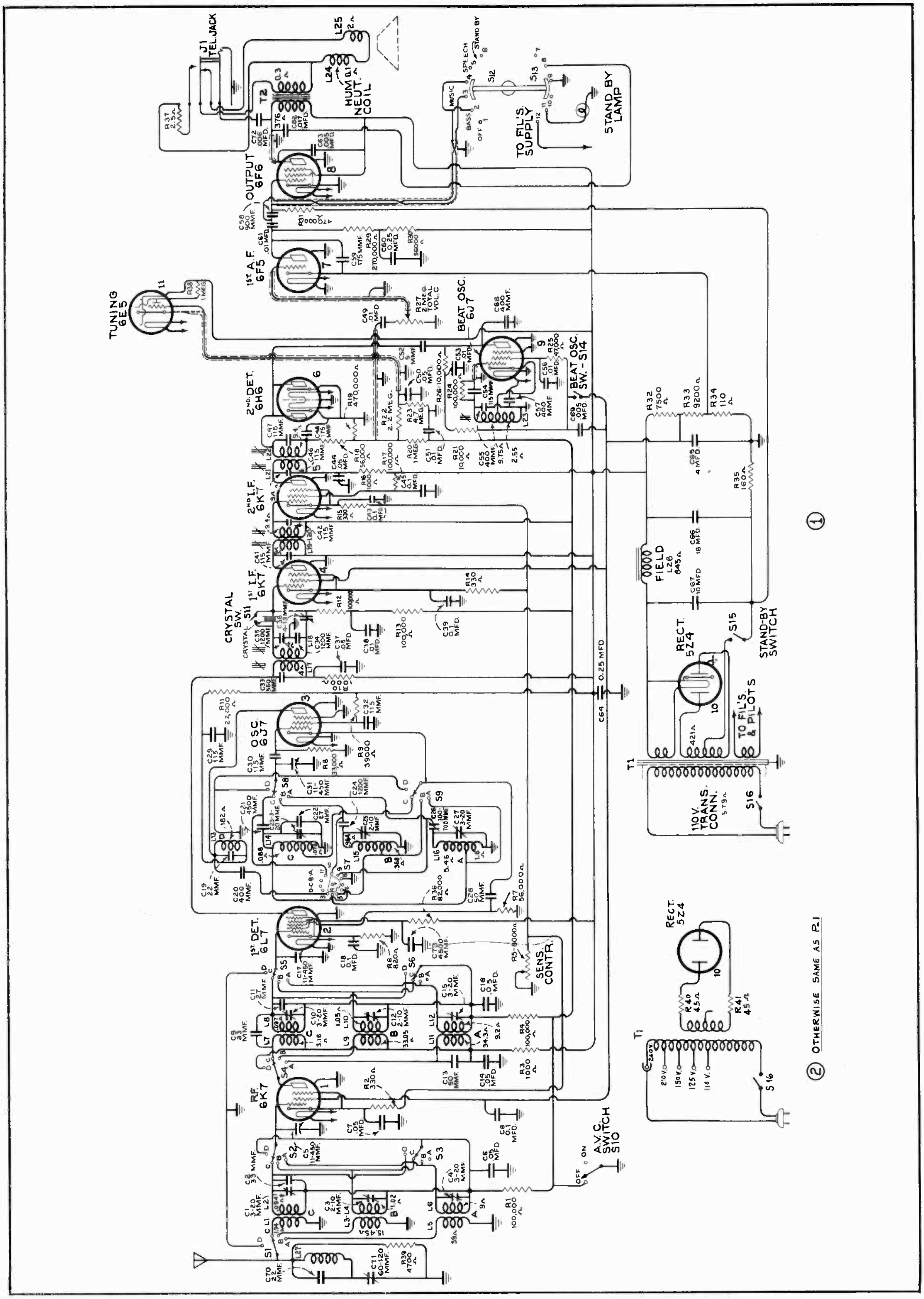


Figure 3—Schematic Circuit Diagram.

Tubes

1 RCA-6K7—Radio-Frequency Amplifier.
1 RCA-6L7—First Detector.
1 RCA-6J7—Oscillator.
2 RCA-6K7—Intermediate-Frequency Amplifiers.
1 RCA-6H6—Second Detector and A.V.C.
1 RCA-6J7—Beat-Frequency Oscillator.
1 RCA-6F5—Audio-Frequency Amplifier.
1 RCA-6F6—Power-Output Amplifier.
1 RCA-5Z4—Full-Wave Rectifier.
1 RCA-6E5—Tuning Indicator.

See diagram on label inside cabinet for locations of tubes and grid leads.

Power-Supply Ratings.—See rating symbol on chassis.

Symbol	*Voltages*	*Frequency (cycles)*
B	105–125	25–60
C	100–130; 140–160; 195–250	40–60

As shipped from the factory, rating "C" instruments are connected for 225-250 volts unless prominently specified otherwise on instrument. Any of these, however, can be converted for operation at 100-117, 117-130 or 195-225 volts when required. Three taps are provided on the primary of the power transformer, a diagram of which is given in Figure 8. All taps are brought out to a terminal board on the top of the transformer and conversion can be made without removing chassis.

Power Consumption.—110 watts.

5. Antenna

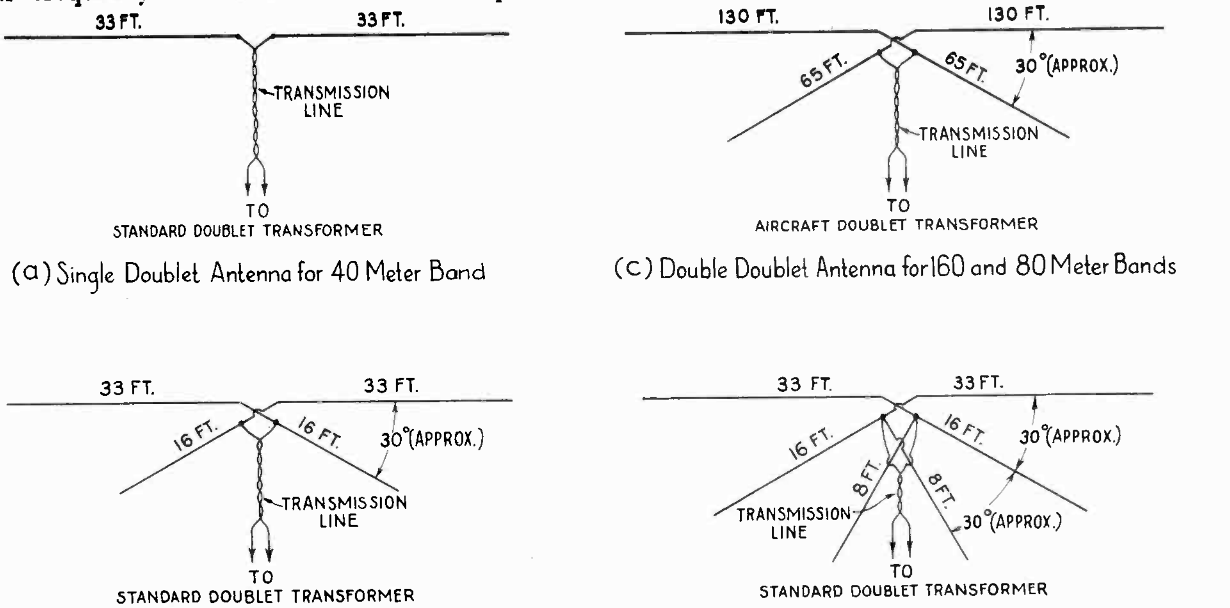
A most important factor in good reception is the antenna. Both "noise reducing" and "directional" properties as well as a definite "length" to suit the signal frequency are essential antenna requirements for good reception. A special system or one of multiple antennas of the *single-wire* or *doublet* type is therefore necessary. The RCA *Double-Doublet* antenna system consists of *two* doublet antennas having different lengths and therefore different resonance characteristics. They are interconnected so that one will compensate for the weak points of the other throughout the intervening frequency range. A *Triple-Doublet* system of lengths cut to suit individual requirements will give still better results. Be sure to obtain the latest information on RCA Antennas. Dipole lengths, as listed in the following table, connected with the coupling transformers specified, are recommended for the respective amateur bands.

Band	Length each side	Coupling Transformer	
Meters	*Feet*	*Type*	*Stock No.*
160	130	Aircraft Doublet	M.I. 5782
80	65	Aircraft Doublet	M.I. 5782
40	33	Standard Doublet	4743
20	16½	Standard Doublet	4743
10	8	Standard Doublet	4743
5	4	Standard Doublet	4743

The triple- or double-doublets are most easily applied to those bands for which the same coupling transformer can be used. For example, a double-doublet with an aircraft type coupling transformer would be best for 160 and 80 meters, or with a standard transformer on 40 and 20 meters, but not with either transformer on 80 and 40 meters.

Proper cross connections must be made on all dipole systems as illustrated in Figure 4.

Standard RCA Transmission Line should be used. Lengths are not critical for the above resonant antenna conditions.



(a) Single Doublet Antenna for 40 Meter Band

(c) Double Doublet Antenna for 160 and 80 Meter Bands

(b) Double Doublet Antenna for 40 and 20 Meter Bands

(d) Triple Doublet Antenna for 40, 20 & 10 Meter Bands

Figure 4—Dipole Antenna Crossover Connections.

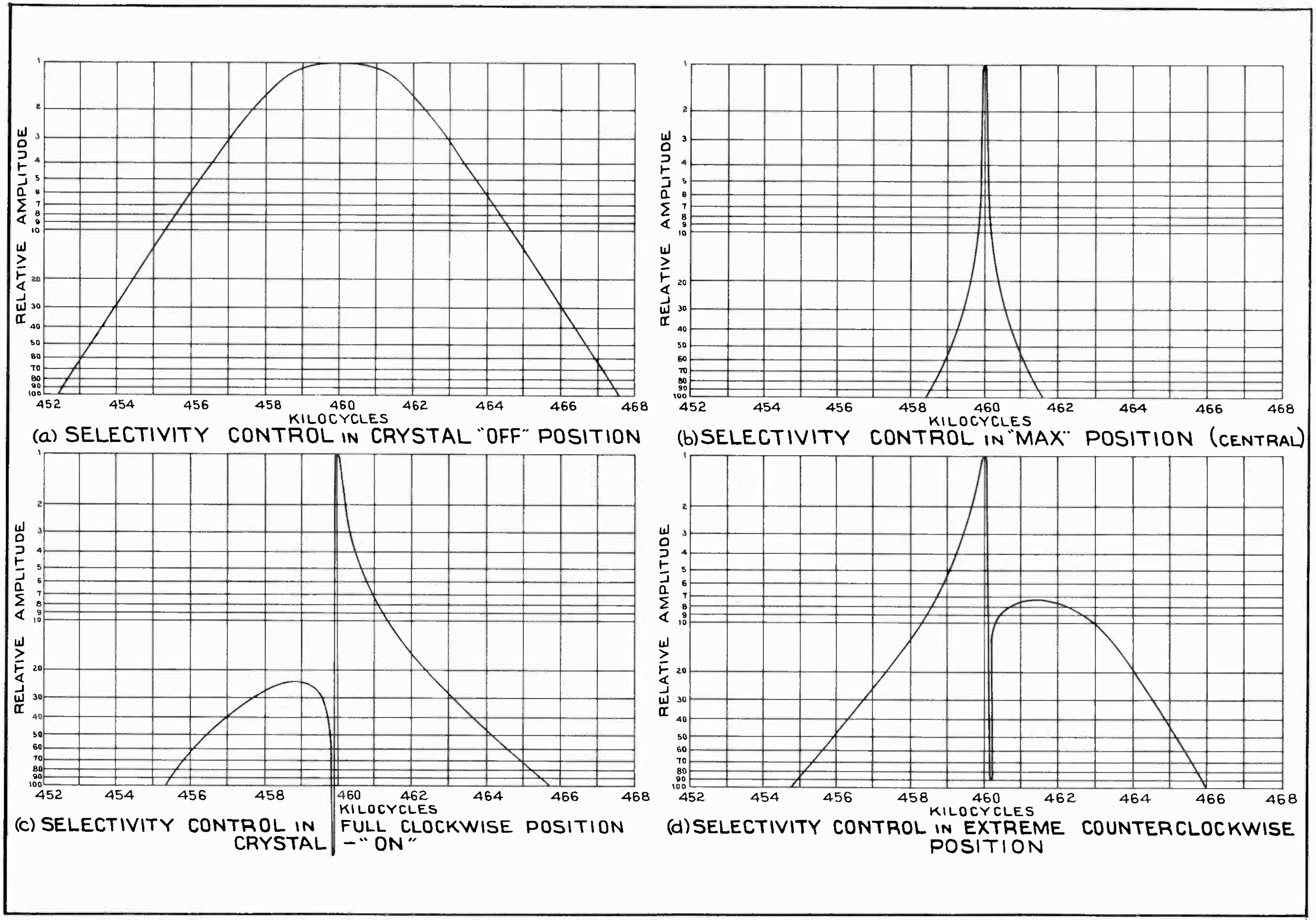


Figure 5—Selectivity Control Curves.—Crystal Filter.

PART III—OPERATION

6. Controls

All controls are located upon the front panel and are identified by adjacent markings.

(a) **Power Switch and Tone Control.**—The first control on the left is a five-position knob operating the a-c line power switch, high-frequency tone control ("Bass"), full tone range contact ("Music"), low-frequency tone control ("Speech"), and "Stand-by" switch, in the sequence given as the knob is turned in a clockwise direction. Power is "off" with this knob in its fully counter-clockwise position. The "Bass" position eliminates "highs" and therefore emphasizes low tones. It reduces static interference due to restriction of the audio response range. The "Music" position gives full tone range reproduction. The "Speech" position reduces the "lows" and emphasizes the high tones, thus clarifying "boomy" voice reception. The "Stand-by" position disconnects all plate and screen grid tube-supply voltages but leaves the filament supply turned on to keep the receiver "warmed up" and ready for instant operation. It also illuminates the "Stand-by" lamp on the left-hand side of the dial. The "Stand-by" is of special use for eliminating the clicks or thumps of the telegraph transmitter, for preventing acoustical feed-back from a phone transmitter, or an adjacent transmitter from blocking the receiver.

(b) **Signal Input Control.**—The second control from the left rotates on a scale calibrated from 1 to 10,000 and its setting indicates the strength in microvolts of any signal delivered to the receiver, when its adjustment is made in conjunction with the electron-ray tube [see next paragraph (c)]. This control is calibrated on a logarithmic scale by means of a series of dots. The markings are labelled for the major settings only, and the points between these major markings represent respectively two and five times the lower indicated value as the knob is turned in a counter-clockwise direction **(1, 2, 5, 10, 20, 50, 100 — --)**.

(c) **Electron-Ray-Tuning Tube.**—The green illuminated *Electron-Ray-Indicator Tube* (RCA-6E5) at the right-hand side of the dial near the top of the front panel is a visible guide to precise tuning. The deflection of the electron stream by the signal voltage causes a narrowing of the darker sector. Maximum deflection, (*i. e.*, when the area of the light sector is at a maximum) indicates that the receiver is tuned to exact resonance.

Since the electron-ray tube gives a reading of signal strength (at the 2nd detector) it is used in conjunction with the *Signal Input Control* to measure signal input. Tune signal to exact resonance, as just described. Rotate the *Signal Input Control* counter-clockwise to reduce the voltage on the *electron-ray tube.* The point at which a slight deflection (1/64-inch) of the dark sector in the *electron-ray tube* occurs is the value in microvolts of the signal input to the receiver. For code reception the correct setting of the *Signal Input Control* to measure signal input is that at which the light green area just commences to flicker.

When measuring signal strength in microvolts it is immaterial whether AVC control switch is "on" or "off."

The calibrated signal input scale reads microvolts direct for the 160, 80, 40 and 20 meter amateur bands. For the 10 and 5 meter bands, multiply the reading by 10 to obtain microvolts.

The absolute accuracy of signal input values depends upon the sensitivity of the receiver. This is determined by accuracy of alignment, condition of tubes, value of line voltage and similar factors. Relative readings between two or more stations of different signal strengths always give dependable results for comparison. Signal input measurements are also useful for making tests on different types of antennas, for reporting improvements to transmitters at distant amateur stations, and for making charts of signal strength variations.

(d) **The Selectivity Control** introduces the crystal filter into the i-f circuit for single-signal reception of c-w telegraph or telephone transmission. Crystal phasing is performed by means of an air-trimmer capacitor. In its midway position marked "Max." the crystal circuit is balanced and maximum selectivity is obtained. This setting is characterized by minimum background noise. In the extreme clockwise position the crystal is short circuited by means of the crystal switch. Other positions broaden the crystal selectivity curve on one side of resonance and cause a rejection dip on the other side. They are useful for phone reception through severe interference.

NOTE—The *Tone Control* should always be turned to "Speech" when the *Crystal Selectivity Control* is in use. This reduces the "lows" which cause instability and flutter under conditions of extreme selectivity.

Four curves are given herewith which illustrate the effect of the *Crystal Selectivity Control.* (See Figure 5.)

(e) **The Automatic Volume Control Switch** eliminates automatic-volume-control action in order to obtain best reception of slow-speed code transmission and to avoid thumping.

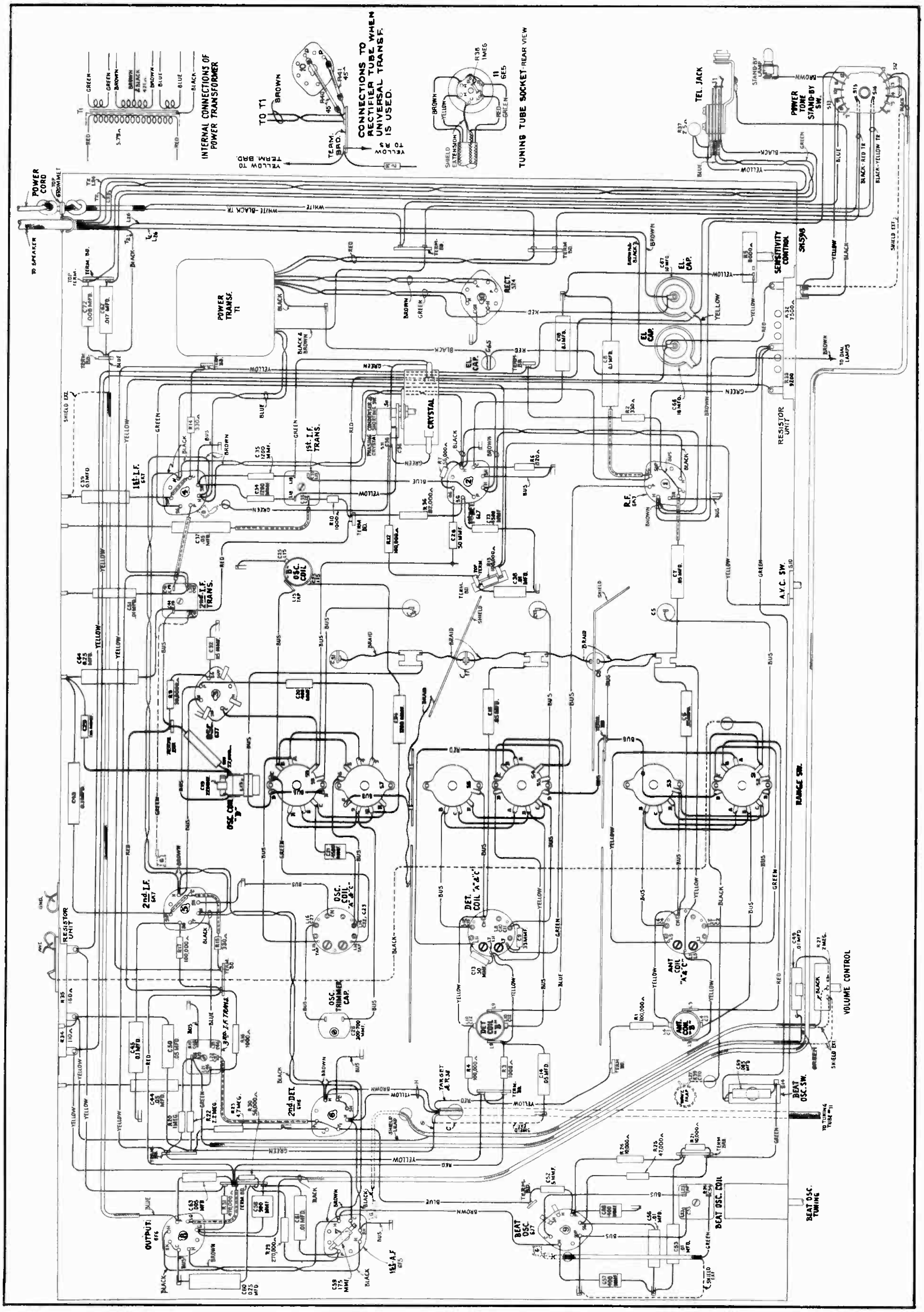


Figure 6—Chassis Wiring Diagram.

(f) **The Tuning Control** is a double knob. The section for rapid tuning is adjacent to the receiver panel and has a speed reduction ratio of 20:1. The second section, in front of the latter and on the inside shaft, is for precise adjustment and has a speed reduction ratio of 100:1. The combination of the high ratio tuning drive and the vernier-index dial make precise and easy tuning readily attainable.

(g) **The Range Selector** selects any one of the four scales of which the frequency limits are tabulated under "Electrical Specifications–Tuning Range" (Section 3). The lettered dial scales correspond to the lettered *Range Switch* positions.

(h) **The Volume Control** is connected in the audio-frequency circuit and increases the output level with clockwise rotation as indicated. It alone is used to regulate volume when the *Automatic Volume Control* is switched "on." However, with the AVC switch "off," the *Signal Input Control* must be used as well, in order to prevent overloading of the Second Detector.

(i) **The Beat Oscillator Switch** serves to interrupt screen and plate-supply voltage to the beat-frequency oscillator tube. The beat-oscillator stage can be rendered inoperative at any time, but, since the filament remains heated continuously, is ready for instantaneous operation.

(j) **The Heterodyne Control** governs the beat-oscillator output frequency over a limited a-f range by means of an iron-core solenoid adjustment (induction tuning) within the beat-oscillator tuning coil. It is calibrated in kilocycles on either side of the normal resonant position (zero beat). In order to obtain a beat note of a desired frequency it is first necessary to tune the receiver to zero beat with the *Heterodyne Control* set at "0," and then to rotate the *Heterodyne Control* to the desired a-f setting.

NOTE—It is important that the "0" position on the *Heterodyne Control* scale correspond *exactly* with the crystal frequency. The proper method of *setting* is given under Service, Section 12.

For c-w reception this control should be set at the desired beat frequency which may be on either side of the "0" position. The human ear is most sensitive at frequencies between 500 and 1500 cycles and settings of this order should therefore be made. The *Selectivity Control* then turned to "Max." has the effect of almost completely suppressing any audio-image which may be produced by a station at a frequency a few kilocycles removed from that of the desired station, causing a beat of nearly equal pitch. The curves (Figure 5) make this apparent. With the *Crystal Selectivity Control* in an intermediate position, adjustment and tuning may be made to place in the "rejection dip" an interfering station within a few hundred cycles of the desired one. The required beat-note is then obtained by adjustment of the *Heterodyne Control*. The higher the beat-frequency used the greater is the audio image.

(k) **The Phone Jack** is on the left end of the cabinet. When a phone plug is inserted in this jack, it simultaneously connects a resistance load across the secondary of the output transformer in place of the voice coil of the electrodynamic loudspeaker. It also connects the phones across the plate circuit of the output tube, a blocking condenser being used to isolate the d-c voltage. The loudspeaker field which is employed as a filter for the rectifier stage, still forms an active part of the circuit when using headphones. By inserting the phone plug part way in the jack both headphone and loudspeaker signals may be obtained. The loudspeaker is connected to the chassis by means of a cable and plug.

7. Dial

The *Tuning Dial* is of the airplane type, semi-transparent, illuminated, and clearly marked. It incorporates a mechanical band-spread system with two vernier scales (outside and central), particularly suited to amateur or other work where precise logging is required. The four main scales are plainly marked with their respective letters—A, B, C, D—and are calibrated directly in megacycles. The amateur bands are shown by solid arcs on the B, C and D scales, together with meter markings in heavy type. The standard and short-wave broadcast bands are indicated by an additional shading line.

The two vernier scales mentioned above are known as the *vernier* and *vernier-index* scales, the former being fully circular and the latter semi-circular.

It will be observed that the *vernier* scale is graduated from "0" to "100" and traversed by the long single-ended red pointer, and that the *vernier-index* scale is graduated from "0" to "9" and traversed by the short double-ended black pointer used for the main frequency scales. The red pointer makes one complete revolution for each unit of travel of the short black pointer on the *vernier-index* scale. Thus, any station may be logged accurately with three digits; for example, if the *vernier-index* reading is between "3" and "4" and the *vernier* reading is "72," then the log number is "372." The index number is always the lower of the two numbers between which the pointer is located. (It may occasionally happen that with the *vernier-index* pointer on or just beyond a digit, the *vernier* pointer may read above 95; the next lower digit is then used as the first of the three figures in the reading.)

In logging stations by this method, the band letter also should be named. For the above example, therefore, the full log number would be "A-372," "B-372," "C-372," or "D-372" depending upon the setting of the range switch.

Band-Spread.— The *Mechanical Band-Spread* incorporated in this instrument is combined with circuit design in such a manner as to render available to the operator the following advantages:

1. Single-control tuning.
2. Precise logging.
3. Ability to reset to a definite frequency without use of reference points.

To assist in operation, a table is given of the tuning knob rotation when tuning through the various amateur bands.

Band		Band-Spread		
Meters	*Kilocycles*	*Pointer Coverage Dial Divisions*	*Slow Speed Knob Angle of Rotation*	
160	1715-2000	366	3590°	10 Rev.
80	3500-4000	141	1380°	3¾ "
40	7000-7300	96	940°	2½ "
20	14000-14400	55	540°	1½ "
10	28000-30000	74	725°	2 "
5	56000-60000	74	725°	2 "

8. Tuning

The r-f amplifier, oscillator and first detector circuits of this superheterodyne receiver are tuned by a three-gang variable capacitor and thus controlled from a single knob. Extremely precise and rapid tuning is attained by means of the dual-ratio vernier-drive system used in conjunction with the gang capacitor as mentioned under "Controls." To tune the instrument for desired reception, proceed as follows:

(a) Turn *Power Switch* "on."

(b) Select position of *Range Switch* at which the band letter corresponds to that frequency scale which includes the desired station or channel.

(c) Set *A.V.C. Switch* "on" and *Beat Oscillator Switch* "off."

(d) Turn *Crystal Selectivity Control* fully clockwise to "Crystal off" position.

(e) Advance *Signal Input Control* fully clockwise for maximum sensitivity.

(f) Advance *Volume Control* clockwise until background noise is heard.

(g) With rear part of tuning knob, rotate black pointer to approximate frequency of desired station, then with the front part make slow adjustment to the exact center of the carrier, as indicated by the *Electron-Ray Indicator*.

(h) Decrease volume as necessary and set *Tone Control* to "Bass," "Music" or "Speech" for preferred quality of reproduction. Full tone range reproduction is obtained with the knob set to "Music."

(i) **Silent Tuning** may be obtained by reducing the volume until no signals are heard, and then tuning by means of the visual indications of the electron-ray tube.

(j) **Weak Modulated Signals.**—The beat-oscillator may be used to advantage in locating weak, modulated signals. For this purpose it should be tuned exactly to the intermediate frequency of the receiver by turning the *Heterodyne Control* to "0," so that an audio-frequency note of ascending pitch will be obtained on each side of resonance of the incoming signal when the *Beat-Oscillator Switch* is turned "on." Any other carrier will be tuned to exact resonance when the gang or tuning capacitor is adjusted for "zero beat" and weak signals will be located almost as well as those of greater strength because of the heterodyne "whistle" produced while passing through resonance. After proper adjustment has been made, turn *Beat-Oscillator Switch* "off."

(k) **C-W Signals.**—For c-w (code) reception, the tuning procedure is the same as for modulated signals except that the *Beat-Oscillator* performs a definite rather than incidental function. It is set, not at the intermediate frequency, but slightly above or below so as to provide an audio-frequency beat note when the receiver is tuned to resonance with any carrier. Adjust the pitch with the *Heterodyne Control* knob. Turn *A.V.C. Switch* "off" when receiving slow speed c-w transmission.

(l) **Selectivity.**—The value of the *Crystal Selectivity Control* is most evident on c-w reception. Its importance should not be forgotten in phone reception and for identification of distant stations which are normally lost in the background noise. The curves (Figure 5) should be studied carefully before operating the *Selectivity Control*. The following suggestions also may be of value:

1. Tuning is extremely critical with control in the "Max." position and in consequence the movement of the slow speed *Tuning* knob should be *very slow* and deliberate.
2. First locate the desired band or station with control at "Crystal off," i. e. in its position of minimum selectivity.
3. Remember to set *Tone Control* at "Speech" for stable operation of *Crystal Selectivity Control.*

PART IV—SERVICE

9. General

The various diagrams of this booklet contain such information as will be needed for servicing the receiver. The ratings of all resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted. Identification titles such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and replacement parts.

10. Circuit Arrangement

A schematic diagram of the complete circuit is shown in Figure 3, a wiring diagram illustrating the wiring layout of the radio chassis, and the wiring and connections between radio chassis and front panel controls, is detailed in Figure 6. The loudspeaker wiring diagram and connections to chassis are shown in Figure 7.

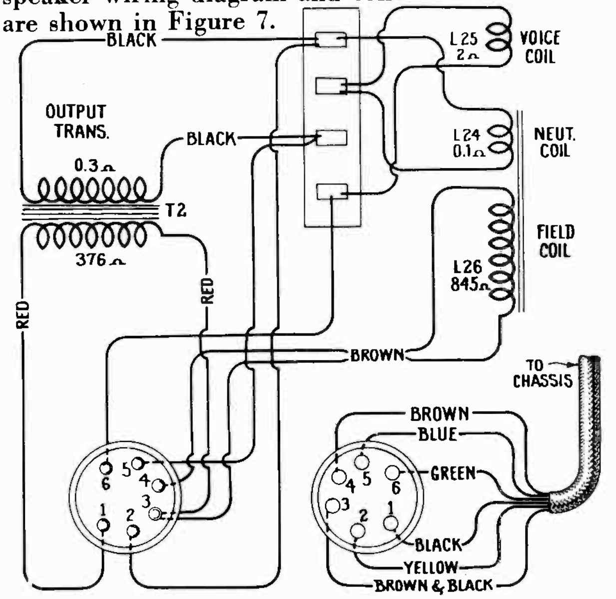


Figure 7—Loudspeaker Wiring and Connection Diagram

The circuit is based on the superheterodyne principle. The radio frequency and audio frequency amplification are balanced in such a manner that the maximum of performance is obtained. The main circuit features are as follows:

(a) **Tuned Circuits.**—A three-section variable condenser tunes the secondary of the antenna transformer, the secondary of the detector input transformer, and the oscillator coil on the A, B and C bands. The D band has only its detector and oscillator tuned. Each tuning range has its own group of r-f and oscillator coils which are selected as desired by operation of the band-change switch. Six adjustable inductance (iron-core) tuned circuits are used in the i-f system, each resonating at 460 kilocycles.

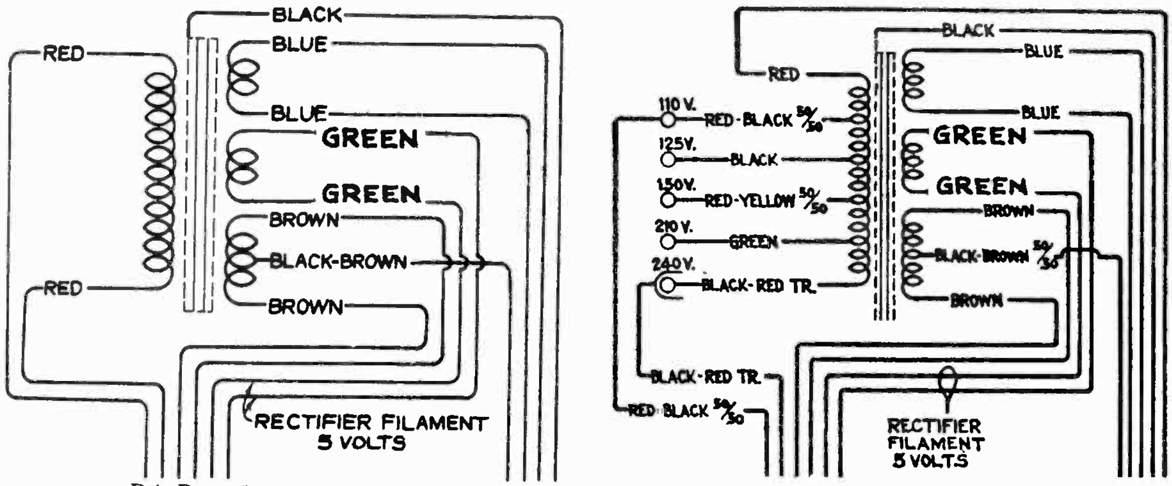
(b) **Band D Tuning.**—The r-f stage is idle when the range switch is turned to its band D position and the signal is fed from the antenna directly to the first detector input circuit. The inductance of this circuit consists of a short length of bus wire to which the antenna lead is tapped at a definite predetermined point. The total length of this inductive wire from the stator of the tuning capacitor to ground represents the secondary of a high frequency auto transformer, while the inductive section, included between the antenna lead tap and ground, forms the primary. Alteration of the dimensions and position of this wiring will change the tuning alignment of the circuit resulting in total lack of operation or seriously poor operation. *It is therefore necessary when servicing to avoid changes in the wiring which includes band D detector and oscillator r-f circuits, unless the arrangement is restored to its exact original condition.* Similar caution should be observed when exchanging by-pass capacitors in these same circuits, since their values, physical positions, length of leads, quality of dielectric and other features are critical, and variations will definitely affect operation of the receiver. The small heater by-pass capacitors and ground terminals installed at the tube sockets are very important in this respect.

(c) **Oscillator Stage.**—The heterodyne oscillator circuit used in this receiver is an improved type, having exceptional frequency stability and uniformity of output over its various tuning ranges. It operates on fundamental frequencies which are fed to the first detector hexode tube (RCA 6L7) on an auxiliary mixing grid. The oscillator generates a signal which is at all times above the frequency of the incoming signal by 460 kilocycles. As shown by the schematic diagram, the cathode of the oscillator tube is above ground potential for r-f while the plate is effectively at ground potential. This particular arrangement, together with the plate and screen series resistors, makes the circuit independent of supply voltage variations in regard to stability and uniformity of output. Separate coils are used for each of the tuning ranges. The switching of the different bands is such as to short circuit certain idle coils which would absorb energy from the circuits used.

(d) **Intermediate Amplifier.**—Two stages of i-f amplification comprising three inductively tuned transformers and two RCA 6K7 tubes are arranged in cascade to operate at 460 kilocycles. The transformers have their primaries as well as their secondaries tuned by adjustable iron cores. Litz wire is used for the windings of all three transformers in order to provide the proper selectivity and gain. The crystal filter is introduced in the first i-f circuit by means of the crystal switch S-11 (Figure 3). A variable air-dielectric capacitor C-36 is operated by the selectivity control.

(e) **Detection and AVC.**—The modulated signal as obtained from the output of the i-f system is detected by an RCA 6H6 double diode tube. The audio frequency secured by this process is passed to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage which develops across resistor R-19 is applied as automatic control grid bias to the r-f, first detector and i-f tubes through suitable resistance capacitance filters. A portion of the audio voltage is passed to the volume control through capacitor C-49. The variable resistor (R-27), a manually controlled acoustically tapered potentiometer, selects the amount fed to the first a-f stage.

The frequency generated by the beat-oscillator (457 to 463 k.c.) for c-w reception is applied to the diode plate of the RCA-6H6 second detector tube through the capacitor C-52. This frequency mixes with the incoming intermediate frequency to produce an audio-frequency note which can be heard readily in the loudspeaker or phones. The



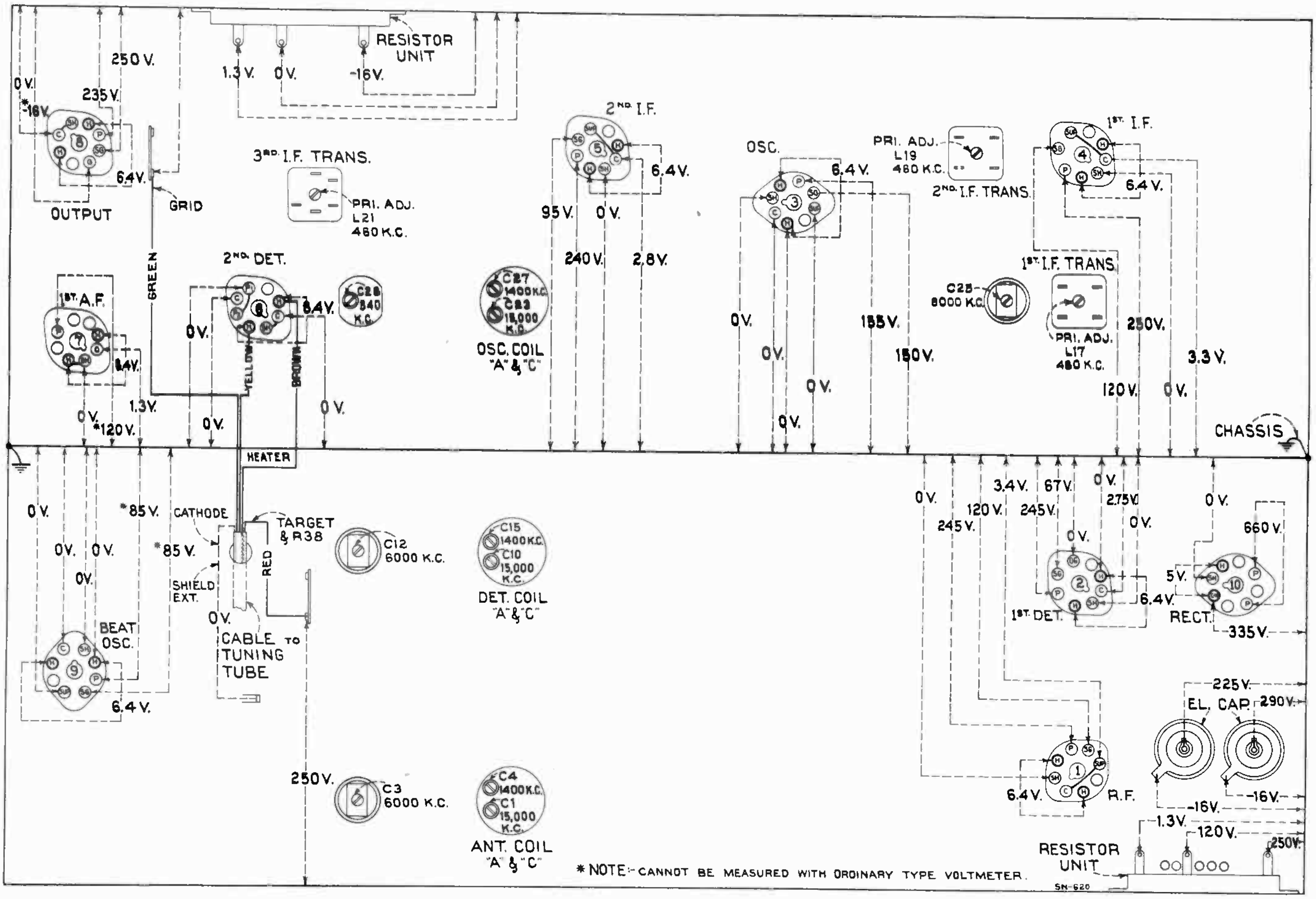
Pri. Res.—5.79 ohms, total
Sec. Res.—420 ohms, total

(a)—Standard Power Transformer

Pri. Res.—7.54 ohms, total
Sec. Res.—268 ohms, total

(b)—Universal Transformer

Figure 8—Transformer Wiring and Connections.



All voltages are measured with the Sensitivity Control at "1" (fully clockwise), Beat-Oscillator "on," Crystal "off," AVC "on," Dial Pointer at 900 Band "A." Grid Cap voltages to ground are "zero," except for the two oscillators.

Figure 9—Radiotron Socket Voltages and Trimmer Locations.

movable iron core, adjusted by the heterodyne control provides a variable inductance which acts as a vernier control for adjustment of the oscillator output frequency over the required a-f range on either side of the signal intermediate frequency.

(f) **Tuning.**— The electron-ray tuning tube (RCA-6E5) functions as amplifier and indicator. The indicator section comprises a luminescent screen, cathode and control electrode. The detected signal from the receiver is applied through the amplifier section to the control electrode of the indicator section. This control electrode affects the electron stream emitted from the cathode so that the size of the triangular "shadow" on the luminescent screen is determined by the strength of the incoming signal. The actual strength of the incoming signal may be measured by means of the signal input sensitivity control, which adjusts the variable resistor R-5 (8,000 ohms maximum), from ground to the cathode circuits of r-f and i-f tubes.

(g) **Audio Stage.** — The a-f component selected by the arm of the volume control is amplified in the first audio-frequency tube (RCA-6F5). It is then fed to the output tube (RCA-6F6) by means of a resistance-capacitance coupling. This tube is connected as a pentode for best reception and sensitivity. The plate circuit of same is matched to the voice coil of the electrodynamic loudspeaker through a step-down (output) transformer. *Audio tone control* is effected by means of a three-position switch: (1) In the "bass" position the capacitor C-58 (in the RCA-6F6 control grid circuit) is shorted out, and the capacitor C-62 (across the plate circuit) is grounded. This allows full "lows" and reduces the high-frequency response. (2) In the "music" position capacitor C-58 is still shorted out, maintaining the low-frequency response, but C-62 is not grounded and thus also allows full "highs," and (3) In the "speech" position C-58 is introduced into the circuit reducing "lows" and C-62 still allows full "highs."

The phone jack is connected between the high side of the primary winding and ground of the output transformer.

(h) **Power.** — All power voltages are obtained from a full-wave rectifier and filter system connected to the a-c line. The loudspeaker field coil is excited from this system and serves as a filter reactor.

The power transformer may be either the "Standard" or the "Universal" type, according to particular requirements, dependent on the power supply. Diagrams showing wiring connections and color coding of leads, together with primary and secondary resistances, are given in Figure 8.

(i) **Wave Trap.**—The wave trap in the antenna circuit is designed for suppression of interference and includes suitable capacitance, resistance and inductance with a variable capacitor for readjustment to produce maximum effect on any long wave interference in the vicinity of the i-f frequency.

11. Alignment

This receiver was aligned at the factory but should be checked regularly (preferably once every six months) to insure best possible results. Adjustments, when necessary, can be performed easily since all trimmers and core screws are accessible through openings in the external case as shown in Figure 9. If desired, the chassis can be withdrawn upon removal of the front panel and four mounting screws.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied, the normal performance of the instrument will be obtained.

Equipment.—The equipment required for placing this receiver in proper alignment consists of an RCA Cathode Ray Oscillograph, Stock No. 9545, or RCA Output Indicator, Stock No. 4317, an RCA Full Range Oscillator, Stock No. 9595, a Tuning Wand and a Non-metallic screw driver or equivalent equipment. The necessity for alignment of the r-f circuits and the direction of required change may be tested with a Tuning Wand. Its use is as follows:

The Tuning Wand, which consists of a bakelite rod having a small brass cylinder installed at one end, and a core of finely divided iron at the other, may be inserted into a tuned coil to obtain an indication of the tuning. With a signal being supplied to the receiver at the alignment frequency of the circuit concerned, each end of the Wand should be placed through the center of the coil. Holes are provided in the r-f coil shields for this test. A change in tuning will be produced by the presence of the brass cylinder or iron core and consequent change of receiver output occurs. If there is a decrease of output when either of the two ends is inserted, the tuning is correct and will require no adjustment. However, should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output, while the iron end causes a decrease, reduction of inductance or capacitance will be necessary to bring the circuit into alignment. This will be equivalent to decreasing the trimmer concerned.

NOTE.—I-F adjustments cannot be made by this method on this receiver.

End of Wand Used	Change of Signal Output	Change Req'd. of Trimmer Capacity
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

I-F Adjustment.—Six adjustments are associated with the three i-f transformers. Their locations on the chassis are shown by Figures 9 and 10. Each must be aligned to the basic frequency of the crystal filter (approximately 460 kc.). The last i-f transformer should be adjusted first, the one preceding it next, and the first transformer last. For such adjustments, proceed as follows:

(a) Connect the "Ant." terminal of the Test Oscillator to the RCA 6L7 1st Detector control grid through a .001 mfd. capacitor, and the "Gnd." terminal to chassis ground. Connect the Output Indicator or Cathode-Ray Oscillograph across the loudspeaker voice coil. Adjust the frequency of the Test Oscillator to 460 kilocycles.

(b) Turn AVC "off" and crystal filter "off" then advance the sensitivity control (clockwise) and the volume control (clockwise), to maximum.

(c) Turn the low-frequency tone control to the "speech" position.

(d) Tune the receiver to Band "A", setting the station selector at a point where no interference is received from local stations or from the RCA-6J7 oscillator tube.

(e) Adjust each of the i-f core screws L-22, L-21, L-20, L-19, L-18, and L-17 in sequence for maximum output as indicated on the Output Indicator or Cathode-Ray Oscillograph.

(f) Turn crystal filter "on" and advance selectivity control counter-clockwise to its mid-position "Max."

(g) Change the frequency of the Test Oscillator *very carefully* to obtain maximum output on the Output Indicator or Cathode-Ray Oscillograph. This process will bring the frequency of the Test Oscillator "in step" with the frequency of the crystal filter. The sharpness characteristic due to the crystal filter will be evident in the sudden increase in output to give the maximum value during this tuning operation.

(h) Then adjust each of the i-f core screws *very carefully* for maximum output. Check this alignment with crystal filter "off" for maximum output. The i-f amplifier is now aligned for maximum sensitivity and selectivity; also to the frequency of the crystal filter.

R-F Adjustments.—Connect the Oscillator output to the antenna and ground terminals of the receiver. Keep the Output Indicator or Cathode-Ray Oscillograph attached to the receiver output as above. For each adjustment, use the minimum signal which will give a perceptible indication on the output device. It may be necessary to reduce the signal input (sensitivity) control slightly due to the high degree of sensitivity of the receiver.

Band "A" (a)—Set the range switch of the receiver to its band "A" position and tune the station selector to a dial reading of 1,400 kc. Tune the Test Oscillator to 1,400 kc. and adjust trimmers C-27, C-15, and C-4 in sequence to produce maximum indicated receiver output.

(b) Shift the Oscillator to 540 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then adjust trimmer C-26, simultaneously rocking the tuning control backward and forward through the signal, until maximum output is obtained from the combined operations. Repeat the alignment of C-27, C-15, and C-4 as in (a) to correct for any change caused by the adjustment of C-26.

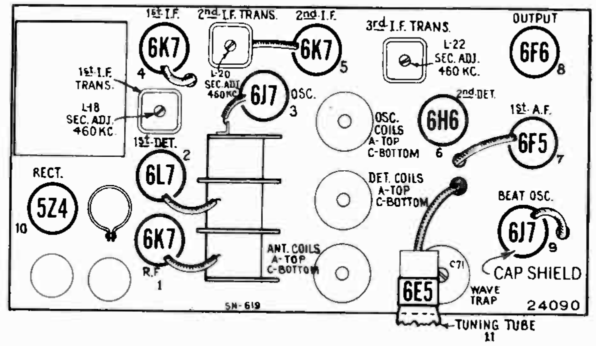


Figure 10—Radiotron and Coil Locations.

Band "B"—Place the receiver range switch in its Band "B" position and tune the station selector to a dial reading of 6,000 kc. Set the frequency of the Test Oscillator to 6,000 kc. Then adjust trimmer C-25 to give maximum receiver output. Two positions may be found which fulfill this condition. The one of least capacitance is correct. To assure that the right peak has been used, tune the *receiver* to 5,080 kc. and increase the Test Oscillator output. The "image" of the 6,000 kc. Test Oscillator signal will be received at this point if C-25 has been adjusted to the proper point of maximum output. *No trimmer adjustments are to be made during this check.* Return the receiver tuning to 6,000 kc., readjust C-25 if necessary, and then adjust the detector and antenna coil trimmers C-12 and C-3 to produce maximum (peak) receiver output as indicated on the output device.

Band "C"—Turn the receiver range selector to its Band "C" position, and set the tuning control to a dial reading of 15,000 kc. Tune the Oscillator to 15,000 kc. Adjust the oscillator parallel trimmer C-23 to produce maximum receiver output. Two positions of the trimmer will be found which fulfill such a condition. The one of least capacitance is correct. To assure that the right position has been used, check for the "image" of the 15,000 kc. signal which will be received at a receiver dial setting of 14,080 kc. if C-23 is correctly adjusted. An increase in Oscillator output may be necessary. No trimmer adjustments should be made during this check. Return the receiver tuning to 15,000 kc., readjust C-23 if necessary, and then adjust the detector and antenna trimmers C-10 and C-1 to give maximum receiver output.

12. Heterodyne Control Setting

Connect a source of unmodulated carrier of the i-f frequency from the grid of the RCA-6L7 first detector to ground. Turn AVC "off," tone control to "speech" position, crystal filter to maximum selectivity, sensitivity control to maximum, audio volume control partially "on," and beat-oscillator "on."

Rotate the heterodyne control knob to left or right until the heterodyne beat is heard.

Change the frequency of the unmodulated carrier from the Test Oscillator *very carefully* for maximum deflection on the Electron-Ray-Tube indicator. Reduce the signal input if necessary so that the Electron-Ray-Tube does not completely close. The test oscillator is now adjusted to the same frequency as the crystal filter.

Set the heterodyne control knob at its zero position and note whether the heterodyne beat is at zero frequency. If not, proceed as follows:

(a) Rotate the heterodyne control knob to obtain zero beat.

(b) Loosen the knob set screw and turn loosened knob on shaft to its "0" or vertical position.

(c) Tighten up set screw.

The heterodyne control is now adjusted to zero beat at the frequency of the crystal filter.

In the event that the frequency drift is such that the zero beat position of the knob is at or beyond the figure "2" on either side, or outside field of rotation, the following adjustment is necessary:

(a) Turn knob until the set-screw-stop on the knob control shaft, behind the front panel, is approximately vertical, then loosen stop with screw driver.

(b) Turn core stud to obtain zero beat. Use a pair of padded long-nose pliers to rotate the core stud in order to avoid injuring thread.

(c) Turn set-screw-stop over to left (facing front panel) to its horizontal mid-position, and adjust knob control shaft to allow 1/32 to 1/16 in. clearance between front panel and adjacent surface of knob.

(d) Tighten set-screw-stop with pliers to grip core stud, then swing stop to vertical and tighten securely with screw driver.

(e) Proceed as first described for setting knob accurately to zero position at zero beat.

NOTE.—Do not pull control shaft loose from bearing bracket when adjusting core stud.

13. Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to ground on Figure 9 will serve to assist in locating causes for faulty operation, when existent. Grid cap voltages to ground are zero, except in the cases of the two oscillators the readings of which are not dependent upon power supply but upon the oscillatory condition. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at the rated supply voltage. Variations in excess of this will usually be indicative of trouble in the basic circuits. The voltages given on the diagram are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance is comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1,000 ohms per volt will be satisfactory when the range used for each check is chosen as high as possible consistent with good readability.

14. Wave Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference. This trimmer is adjusted to 460 kc. during manufacture; however, local conditions may require a readjustment, depending upon the interfering frequency.

SERVICE HINTS

(1) Beat-frequency oscillator instability may occasionally be due to a broken or damaged magnetite core, in which case the Stock No. 12084 coil of improved design with compression spring behind core, should be used.

(2) Image response, or appearance of same station at two points should be corrected by careful alignment in accordance with instructions.

PART V—REPLACEMENT

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condensor mounting bushing assembly—Package of 3	.43
12115	Cable—6-conductor braided reproducer cable approximately 75-in. long—Complete with 6-contact female connector, Stock No. 11934	1.55
11350	Cap—Grid contact cap—Package of 5	.20
11223	Capacitor—Adjustable capacitor (C26)	.46
12077	Capacitor—5 Mmfd. (C52)	.42
11941	Capacitor—22 Mmfd. (C19)	.22
11321	Capacitor—33 Mmfd. (C9)	.26
11289	Capacitor—50 Mmfd. (C13, C28)	.26
11291	Capacitor—115 Mmfd. (C29, C30, C32)	.24
8076	Capacitor—115 Mmfd. (located in beat-oscillator coil, Stock No. 12084) (C54)	.20
11998	Capacitor—115 Mmfd. (C41, C42, C46, C47)	.28
5116	Capacitor—175 Mmfd. (C59)	.18
11500	Capacitor—175 Mmfd. (C48)	.18
11290	Capacitor—400 Mmfd. (C20, C57, C68)	.25
12086	Capacitor—400 Mmfd. Located in beat-oscillator coil Stock No. 12084 (C55)	.25
12104	Capacitor—560 Mmfd. (C33)	.24
11633	Capacitor—900 Mmfd. (C58)	.32
11939	Capacitor—1200 Mmfd. (C34, C35)	.42
12571	Capacitor—1225 Mmfd. (C24)	.20
11287	Capacitor—4500 Mmfd. (C21, C73)	.30
4838	Capacitor—.005 Mfd. (C69)	.20
4868	Capacitor—.005 Mfd. (C63)	.20
11938	Capacitor—.006 Mfd. (C72)	.32
4858	Capacitor—.01 Mfd. (C38, C51, C53, C56, C61)	.25
4624	Capacitor—.01 Mfd. (C49)	.54
11451	Capacitor—.017 Mfd. (C62)	.18
4836	Capacitor—.05 Mfd. (C6, C7, C16, C50)	.30
4886	Capacitor—.05 Mfd. (C14, C37, C44)	.20
5170	Capacitor—0.25 Mfd. (C60, C64)	.25
4841	Capacitor—0.1 Mfd. (C18, C39, C43)	.22
4839	Capacitor—0.1 Mfd. (C8, C45)	.28
11248	Capacitor—4 Mfd. (C65)	1.06
11203	Capacitor—10 Mfd. (C67)	1.18
5212	Capacitor—18 Mfd. (C66)	1.16
12092	Coil—Antenna coil—"A" and "C" bands (L1, L2, L5, L6, C1, C2, C4)	2.24
12098	Coil—Antenna coil—"B" band (L3, L4, C3)	.82
12084	Coil—Beat frequency oscillator coil (L23, C54, C55, R24)	1.70
12093	Coil—Detector coil—"A" and "C" bands (L7, L8, L11, L12, C10, C11, C15)	2.34
12099	Coil—Detector coil—"B" band (L9, L10, C12)	.88
12094	Coil—Oscillator coil—"A" and "C" bands (L14, L16, C22, C23, C27)	2.14
12100	Coil—Oscillator coil—"B" band (L15, C25)	.82
5221	Coil—Oscillator coil—"D" band (L13)	.64
11214	Condenser—3-gang variable tuning condenser (C5, C17, C31)	4.20
12089	Condenser—Crystal switch and phasing control condenser—Less extension shaft (S11, C36)	1.25
11934	Connector—6-contact female connector for reproducer cable, Stock No. 12115	.38
12006	Core—Adjustable core for I.F. transformer, Stock Nos. 12095, 12096 or 12097	.22
12085	Core—Adjustable core and stud assembly—For beat-oscillator coil, Stock No. 12084	.16
12107	Coupling—Extension shaft coupling for Stock No. 12089 phasing control	Price on application
12108	Crystal—Crystal filter and case	14.00
11246	Foot—Chassis foot and bracket—Package of 2	.76
8041	Plate—I.F. or R.F. coil shield locking plate—Package of 2	.12
11244	Resistor—Voltage divider resistor, comprising one 7,500-ohm and one 9,200-ohm section (R32, R33)	1.08
12102	Resistor—Voltage divider resistor, comprising one section of 160-ohm and one section 110-ohm (R34, R35)	.44
11937	Resistor—2.5 ohms—wire wound (R37)	1.12
12432	Resistor—45 ohms—Flexible type (R40, R41)—For use only in models with 110-220-volt power transformer—Package of 5	.60
11932	Resistor—330 ohms—carbon type, 1/10-watt (R14, R15)—Package of 5	.75
11296	Resistor—330 ohms—carbon type, ¼-watt (R2)—Package of 5	1.00
5165	Resistor—820 ohms—carbon type, ¼ watt (R6)—Package of 5	1.00
11935	Resistor—1,000 ohms—carbon type, 1/10-watt (R10)—Package of 5	.75
5112	Resistor—1,000 ohms—carbon type, ¼-watt (R3, R16)—Package of 5	1.00
3381	Resistor—10,000 ohms—carbon type, ¼-watt (R21, R26)—Package of 5	1.00
8070	Resistor—22,000 ohms—carbon type, ½-watt (R11)—Package of 5	1.00
11300	Resistor—33,000 ohms—carbon type, 1/10-watt (R8)—Package of 5	.75
8067	Resistor—39,000 ohms—carbon type, ½-watt (R9)—Package of 5	1.00
11646	Resistor—47,000 ohms—carbon type, ¼-watt (R25)—Package of 5	1.00
11282	Resistor—56,000 ohms—carbon type, 1/10-watt (R7, R18)—Package of 5	.75
5029	Resistor—56,000 ohms—carbon type, ¼-watt (R30)—Package of 5	1.00
8064	Resistor—82,000 ohms—carbon type, ½-watt (R36)—Package of 5	1.00
3118	Resistor—100,000 ohms—carbon type, ¼-watt (R1, R4, R12, R13, R17)—Package of 5	1.00
11281	Resistor—100,000 ohms—carbon type, 1/10-watt (R24)—Package of 5	.75
11323	Resistor—270,000 ohms—carbon type, ¼-watt (R29)—Package of 5	1.00
11172	Resistor—470,000 ohms—carbon type, ¼-watt (R31)—Package of 5	1.00
11452	Resistor—470,000 ohms—carbon type, 1/10-watt (R19)—Package of 5	.75
12013	Resistor—1 Megohm—carbon type, 1/10-watt (R38)—Package of 5	.75
3033	Resistor—1 Megohm—carbon type, ¼-watt (R20)—Package of 5	1.00
11626	Resistor—2.2 Megohm—carbon type, ¼-watt (R22)—Package of 5	1.00
11936	Resistor—4.7 Megohm—carbon type—¼-watt (R23)—Package of 5	1.00
12090	Sensitivity Control (R5)	1.22
4669	Screw—8-32 x 5/32-in. set screw for extension shaft, Stock No. 12105—Package of 10	.25
12103	Shaft—Extension shaft for phasing control, Stock No. 12089	.15
12105	Shaft—Extension shaft for beat-oscillator coil adjustment	.15

The prices quoted above are subject to change without notice

PART V—Continued

Stock No.	Description	List Price
5249	Shield—Antenna, detector or oscillator coil shield	.20
12112	Shield—First or third I.F. transformer shield	.28
12111	Shield—Second I.F. transformer shield	.28
12110	Shield—Top cap shield for Radiotron 6J7 beat-oscillator	.14
11195	Socket—5-contact 5Z4 Radiotron socket	.15
11313	Socket—5-contact 6F5 Radiotron socket	.18
11198	Socket—7-contact 6L7, 6F6, 6H6 second I.F. or R.F. 6K7 Radiotron socket	.15
12113	Socket—7-contact 6J7 beat-oscillator Radiotron socket	.16
12114	Socket—7-contact 6J7 oscillator Radiotron socket	.16
11196	Socket—8-contact first I.F. 6K7 Radiotron socket	.15
11381	Socket—Tuning tube socket and cover	.45
12106	Spring—Retaining spring for beat-oscillator shaft, Stock No. 12105—Package of 5	.15
12374	Switch—Beat-frequency oscillator switch (S14)	.55
12109	Switch—Automatic volume control switch (S10)	.30
12088	Switch—Combination power, tone and stand-by switch (S13, S15, S16)	1.00
12091	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9)	3.55
5238	Terminal—Antenna terminal board and clip	.14
12095	Transformer—First intermediate frequency transformer (L17, L18, C33)	1.50
12101	Transformer—Power transformer, 105-125 volts, 25-60 cycle (T1)	5.20
12331	Transformer—Power transformer, 105-130, 140-160, 195-250 volts, 50-60 cycle	5.15
12096	Transformer—Second intermediate frequency transformer (L19, L20, C41, C42)	1.85
12097	Transformer—Third intermediate frequency transformer (L21, L22, C46, C47, C48, R18, R19)	2.52
11649	Trap—Wave-trap (L27, C70, R39)	1.15
12087	Volume Control (R27)	1.84
	DRIVE ASSEMBLIES	
11952	Dial—Station selector dial scale	.78
12116	Drive—Variable tuning condenser drive assembly—Comprising reflector, bracket, drive, hub and gear assembled	1.35
11982	Fastener—Station selector dial scale fastener —Package of 25	.42
4827	Gear—Spring gear assembly for vernier pointers	1.25
11228	Gear—Vernier pointer drive gear	.42
11303	Indicator—Station selector vernier indicator pointer	.22
4520	Indicator—Station selector indicator pointer	.18
4340	Lamp—Dial lamp—Package of 5	.60
12577	Screw—8-32 x $1\frac{1}{4}$ in. slotted set screw for drive assembly—Package of 10	.15
12117	Shaft—Dual speed drive shaft for variable condenser drive assembly — Comprising shaft, drive, spool, spring and washer—assembled	.36
11222	Socket—Dial lamp socket	.18
	MISCELLANEOUS ASSEMBLIES	
11192	Clamp—Tuning tube mounting clamp	.12
12122	Escutcheon—Station selector escutcheon	.60
12130	Foot—Rubber foot assembly—Package of 4.	.25
6614	Glass—Station selector dial glass	.30
12128	Jack—Telephone jack (J1)	1.02
12124	Knob—Heterodyne adjustment or selectivity control knob—Package of 5	.70
12123	Knob—Power (Tone), signal input, AVC, range, volume or beat-oscillator control knob—Package of 5	.70
12129	Knob—Station selector knob assembly — Comprising 1 main and 1 vernier tuning knob—Package of 5	2.10
4340	Lamp—Pilot lamp—Package of 5	.60
12120	Panel—Control panel	1.68
12121	Panel—Front panel assembly, complete	5.45
4678	Ring—Spring ring for station selector dial glass—Package of 5	.34
12127	Screw—Chassis mounting screw assembly—Package of 4	.18
12126	Screw—6-32 x $\frac{3}{8}$-in. fillister head screw—Used to hold front panel—Package of 10.	.42
12125	Screw—8-32 x 5/16-in. cupped point set screw for knob, Stock No. 12124—Package of 10	.20
4982	Spring—Retaining spring for main tuning knob in Stock No. 12129—Package of 10.	.26
11349	Spring—Retaining spring for knob, Stock No. 12123—Package of 5	.15
11222	Socket—Pilot lamp socket	.18
	REPRODUCER ASSEMBLIES	
11954	Board—Terminal board assembly, with eyelets and lead wire clips	.14
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil (L26)	2.00
11233	Coil—Neutralizing coil (L24)	.30
11235	Cone—Reproducer cone (L25)—Package of 5	3.50
11953	Connector—6-contact male connector for reproducer	.28
9658	Reproducer complete—Less baffle assembly	6.16
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer—Used to hold field coil securely—Package of 5	.20

The prices quoted above are subject to change without notice

IB25099-2

RCA VICTOR MODELS T 6-7 and C 6-8

Six-Tube, Three-Band, A-C, D-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Radiotron Complement

(1) RCA-6A8............First Detector-Oscillator	(4) RCA-6J7............Audio Voltage Amplifier
(2) RCA-6K7.............Intermediate Amplifier	(5) RCA-25A6...........Audio Power Amplifier
(3) RCA-6H6..........Second Detector—A.V.C.	(6) RCA-25Z6..............Half-Wave Rectifier

Frequency Ranges

Band A	540- 1,600 kc.
Band B	1,600- 5,500 kc.
Band C	5,500-18,000 kc.

Alignment Frequencies

Band A	600 kc. (osc.), 1,400 kc. (osc., ant.)
Band B	None required
Band C	18,000 kc. (osc., ant.)

Intermediate Frequency .... **460 kc.**

Power Supply Ratings

Rating A	105-125 Volts, 50-100 Cycles, 60 Watts 105-125 Volts, D-C 50 Watts
Rating B	105-125 Volts, 25-100 Cycles, 80 Watts 105-125 Volts, D-C 50 Watts

Power Output (125 V. Line)

Undistorted ..0.5 Watt (A-C)....0.4 Watt (D-C)
Maximum ....1.2 Watts (A-C)....1.0 Watt (A-C)

Loudspeaker

Type ....Electrodynamic
Voice Coil Impedance......2.25 Ohms—400 Cycles

Mechanical Specifications

Chassis Base Dimensions .... 12 inches x 7 inches x $2\frac{1}{2}$ inches
Tuning Drive Ratio .... 10-to-1 and 50-to-1

Model T 6-7

Height	$19\frac{1}{8}$ inches
Width	$13\frac{5}{8}$ inches
Depth	$8\frac{1}{2}$ inches
Weight (Net)	17 pounds
Weight (Shipping)	22 pounds

Model C 6-8

Height	$37\frac{1}{4}$ inches
Width	$23\frac{1}{2}$ inches
Depth	11 inches
Weight (Net)	$39\frac{1}{2}$ pounds
Weight (Shipping)	54 pounds

General Features

These two models each employ the same six-tube chassis. They have the new metallic tubes. The tuning range is from 540 to 18,000 kc. The coverage includes domestic broadcast, police, aircraft and amateur services, and also the important foreign short-wave broadcast bands at 49, 31, 25, 19 and 16 meters. Chassis features include automatic volume control, high-frequency tone control, antenna wave trap and audio tone compensation. The table model (T 6-7) uses an 8-inch dynamic speaker, and the console model (C 6-8) uses an improved 12-inch dynamic speaker. The tuning dial is an illuminated semi-airplane type. Positions of the range selector knob are marked on the control panel to show which tuning band is in use. The tuning control is of the dual-ratio type, which permits rough tuning through a 10-1 drive ratio and vernier tuning through a 50-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.

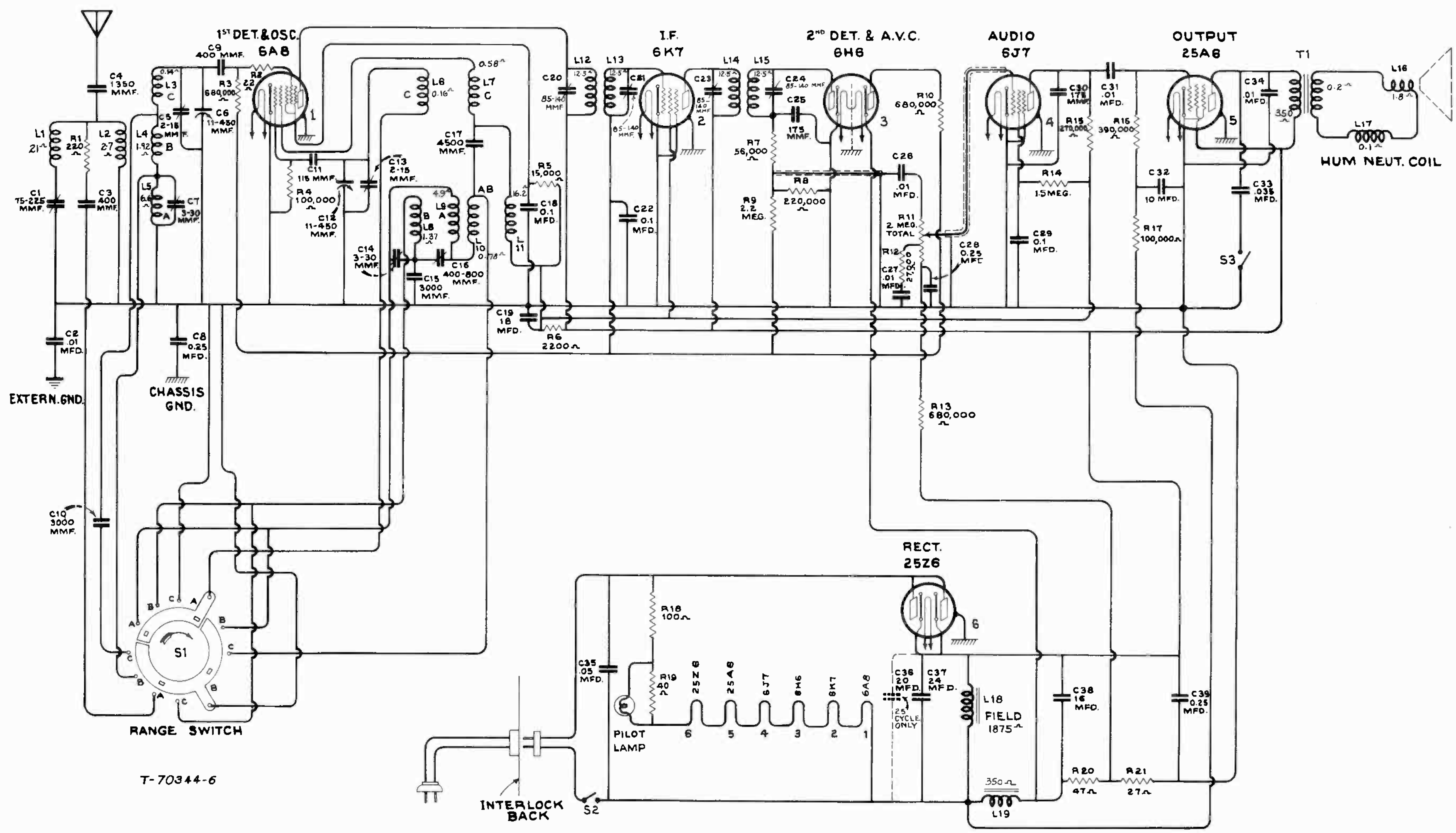


Figure 1—Schematic Circuit Diagram

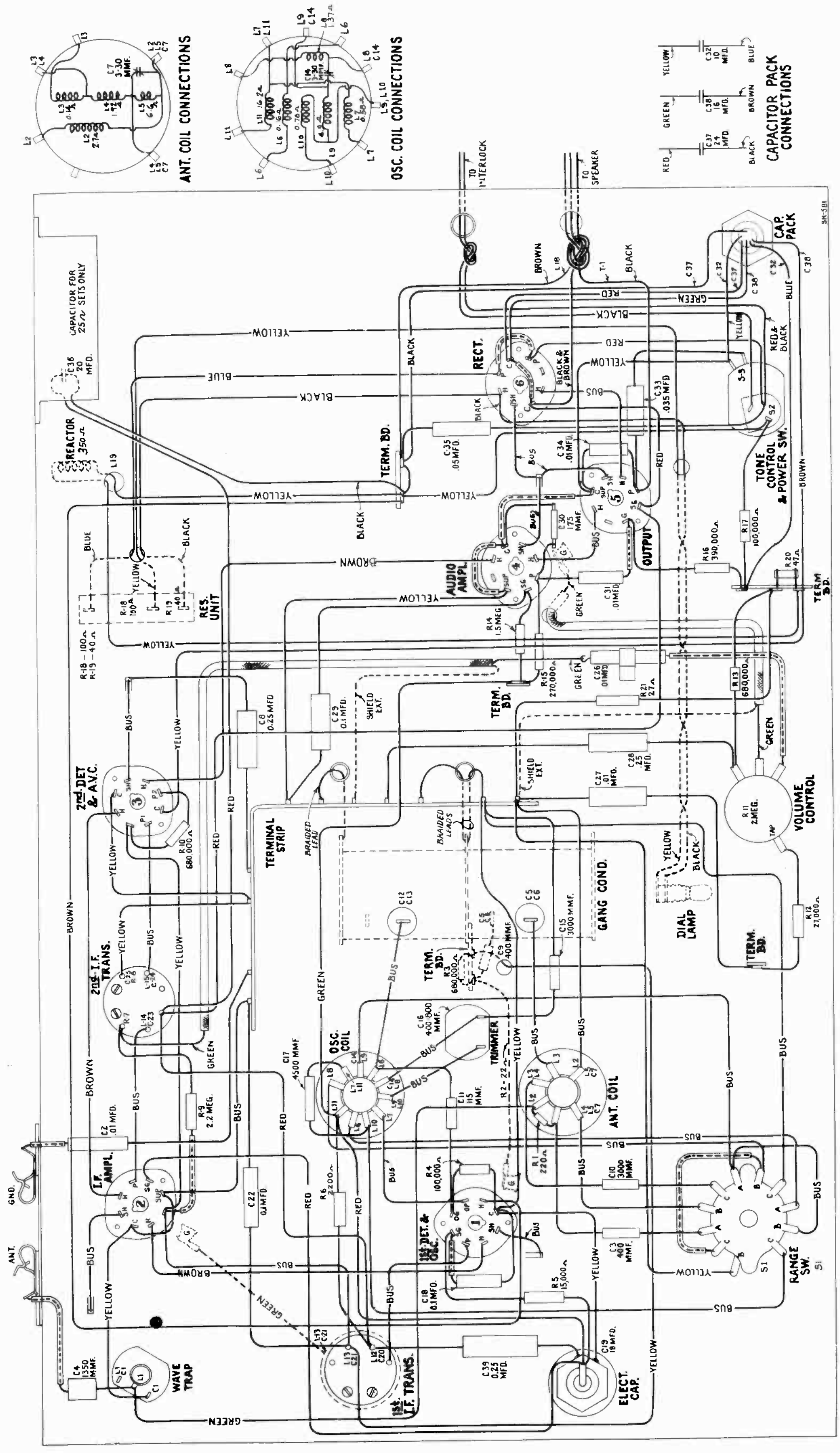


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional superheterodyne type of circuit, consisting of a combined first detector-oscillator stage, a single i-f stage, a diode detector-automatic volume control stage, an audio voltage amplifier stage, an audio power output stage and a half-wave rectifier power supply stage, is used.

Tuned Circuits

The antenna coil system consists of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these two coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable two-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8, R-9 and R-10, thereby maintaining the desired minimum operating bias on such tubes. As soon as the rectified signal current develops sufficient voltage across resistor R-8, in opposition to that across resistors R-20 and R-21, current ceases to flow in the auxiliary diode circuit and the signal A.V.C. diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio voltage amplifier tube. This control has a tone compensating filter connected to it, so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first audio stage and the power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of the output tube. This capacitor may be cut in or out of the circuit as desired by means of a switch (S-3).

Rectifier

The plate, grid, and cathode voltages required for the operation of this receiver are supplied by the RCA-25Z6 rectifier (plates and cathodes connected in parallel respectively) in series with the supply line operating as a half-wave rectifier. The field of the loudspeaker is connected across the input to the filter. The filter circuit consists of reactor L-19 and capacitors C-37 and C-38. An additional capacitance C-36 is connected in parallel with C-37 in models designed for 25-cycle operation.

The filaments of all six tubes are connected in series and are fed direct from the supply line, the voltage being dropped to the required value by resistors R-18 and R-19. The correct operating voltage for the pilot lamp is developed across resistor R-19. This voltage across the pilot lamp will be slightly high when the set is first turned on, but will quickly drop to a normal value as soon as the tube filaments reach their operating temperature.

SERVICE DATA

CAUTION: Grid caps, tuning condenser, and resistor on top of chassis may be hot with respect to external ground and should be avoided when servicing, unless due precautions are taken.

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system and two in the antenna coil system. These trimmers have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate, or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The RCA Victor Stock No. 9595 Full Range Oscillator and the RCA Victor Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors:

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator through a .05 mfd. condenser to the RCA-6A8 control grid. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, C-23 and C-24, of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, C-20 and C-21, of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to A.V.C. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The two trimmers, which are at all times directly in shunt with the variable tuning condenser, necessitate that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the initial adjustment. The output indicator should be left connected to the output system and the volume control kept at maximum. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver input.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the **horizontal** graduation (approximately 530 kc.) at the low-frequency end of the Band A scale.

Proceed further as follows:

(a) Adjust the test oscillator to **18,000 kc.** and set the receiver tuning control to a dial reading of **18,000 kc.**

(b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer C-13 on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of *maximum trimmer capacitance* is correct and should be used. (The oscillator will be 460 kc. below the signal frequency at this adjustment point.)

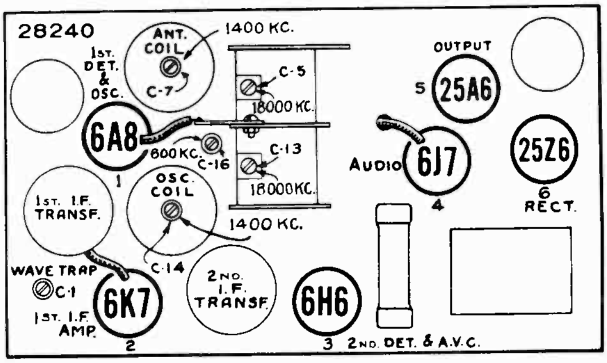


Figure 3—Radiotron, Coil and Trimmer Locations —R. F. Trimmer Adjustment

(c) Adjust the trimmer C-5 of the antenna section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **18,000 kc.** input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment, which would otherwise be caused by the interaction between the heterodyne oscillator circuit and the antenna tuned circuit.

(d) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of **1400 kc.** Tune the test oscillator to this same frequency and regulate its output to produce a slight indication on the receiver output indicating device.

(e) Adjust the high-frequency trimmers of the Band A oscillator and antenna coils, C-14 and C-7 respectively, to the points at which each produces maximum indicated receiver output.

(f) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(g) Tune the low-frequency trimmer C-16 of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of C-14 and C-7 should be corrected at **1400 kc.** to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts and grid caps to –B ground bracket on Figure 4 will assist in the location of causes for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 900 kc. (Band A); no signal being received and volume control at minimum. To duplicate the conditions under which the voltages were measured requires a 1000-ohm-per-volt d-c meter, having ranges of 10, 50 and 250 volts. Voltages below 10 read on 10-volt scale, between 10 and 50 on 50-volt scale, and between 50 and 250 on 250-volt scale. A-C voltages were measured with a corresponding a-c meter.

Wave Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.

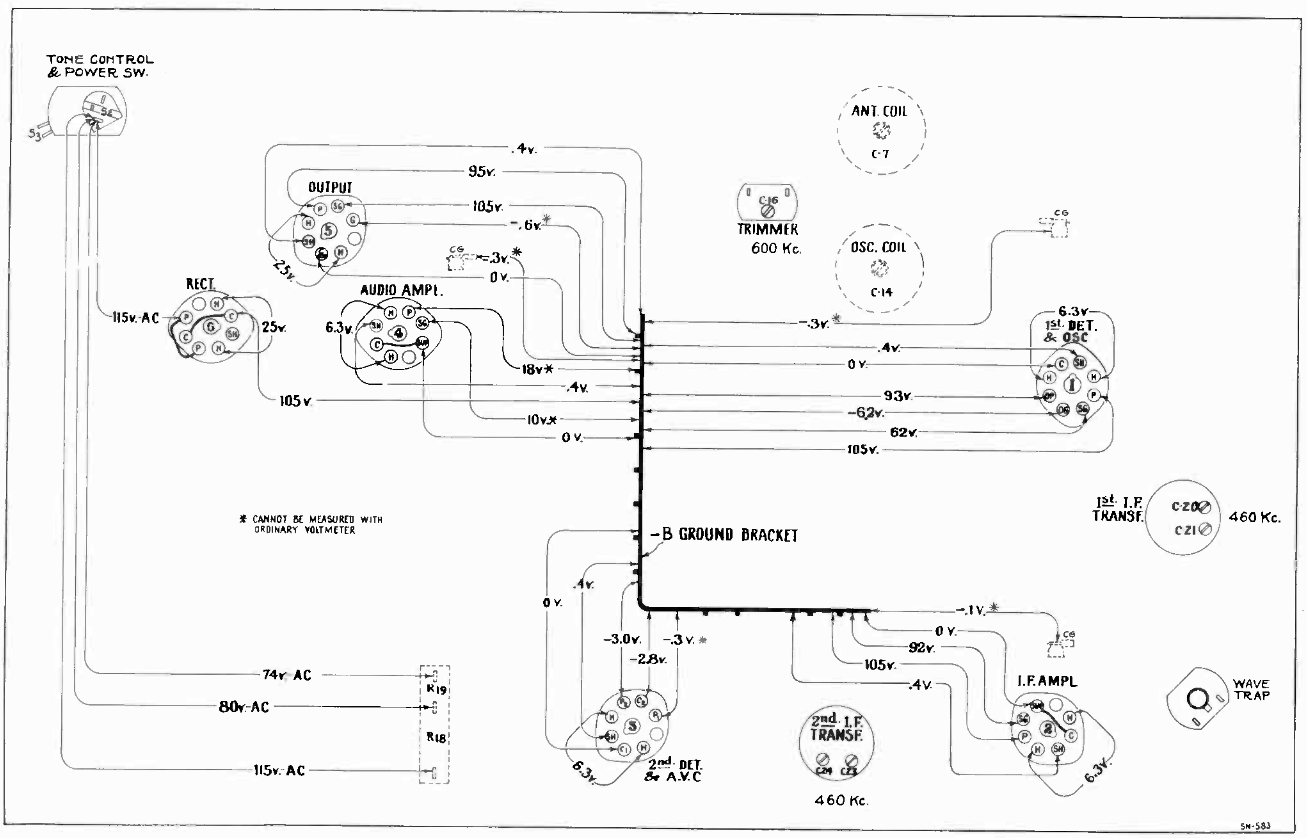


Figure 4—Radiotron Socket Voltages

Measured at 115 volts, 60-cycle supply—For 115 volt D-C approximately 5% lower
Tuned to approximately 900 kc. (Band A)—No Signal Being Received—Volume control set at minimum

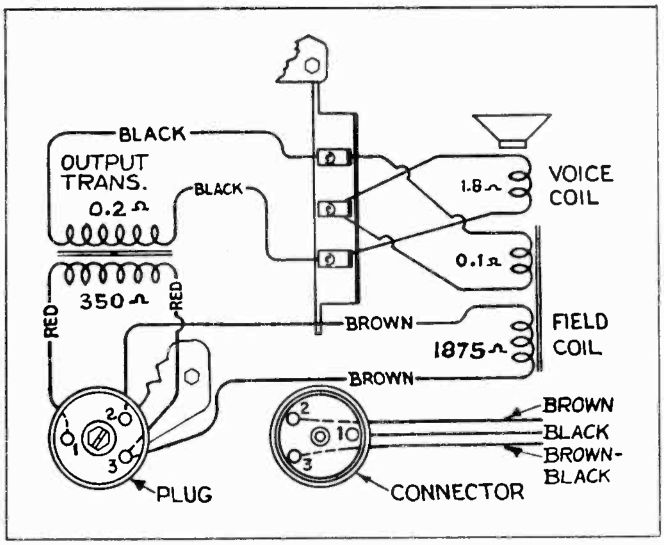


Figure 5—Loudspeaker Wiring

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43
11350	Cap—Grid contact cap—Package of 5	.20
11465	Capacitor—Adjustable capacitor—(C16)	.48
11291	Capacitor—115 Mmfd.—(C11)	.24
5116	Capacitor—175 Mmfd.—(C30)	.18
11290	Capacitor—400 Mmfd.—(C3, C9)	.25
11449	Capacitor—1350 Mmfd.—(C4)	.26
11622	Capacitor—3000 Mmfd.—(C10, C15)	.36
11287	Capacitor—4500 Mmfd.—(C17)	.30
5196	Capacitor—.035 Mfd.—(C33)	.18
4858	Capacitor—.01 Mfd.—(C2, C27, C31, C34)	.25
11395	Capacitor—.01 Mfd.—(C26)	.18
4886	Capacitor—.05 Mfd.—(C35)	.20
4840	Capacitor—0.25 Mfd.—(C28)	.30
5170	Capacitor—0.25 Mfd.—(C8, C35)	.25
4839	Capacitor—0.1 Mfd.—(C18)	.28
4841	Capacitor—0.1 Mfd.—(C22, C29)	.22
5212	Capacitor—18 Mfd.—(C19)	1.16
11821	Capacitor Pack—Comprising one 24 Mfd., one 16 Mfd., and one 10 Mfd. sections—(C32, C37, C38)	3.60
11617	Coil—Antenna coil—(L2, L3, L4, L5, C7, R1)	1.68
11618	Coil—Oscillator coil—(L6, L7, L8, L9, L10, L11, C14)	2.22
11612	Condenser—2-gang variable tuning condenser—(C5, C6, C12, C13)	3.80
11979	Connector—2-contact male connection plug	.20
11974	Dial—Station selector dial scale	.65
11613	Drive—Variable tuning condenser drive	1.00
11893	Indicator—Station selector indicator pointer	.28
4340	Lamp—Dial lamp—Package of 5	.60
11818	Reactor—Filter reactor—(L19)	1.85
11977	Resistor—Wire wound—Comprising one 100- and one 40-ohm section—(R18, R19)	$0.58
11624	Resistor—22 ohms—Flexible type—complete with contact cap—(R2)	.22
11955	Resistor—27 ohms—Carbon type—¼ watt—(R21)—Package of 5	1.00
11372	Resistor—47 ohms—Carbon type—¼ watt—(R20)—Package of 5	1.00
5159	Resistor—2,200 ohms—Carbon type—¼ watt—(R6)—Package of 5	1.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt—(R5)—Package of 5	1.00
11400	Resistor—27,000 ohms—Carbon type—¼ watt—(R12)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—(R4, R17)—Package of 5	1.00
11323	Resistor—270,000 ohms—Carbon type—¼ watt—(R15)—Package of 5	1.00
11847	Resistor—390,000 ohms—Carbon type—¼ watt—(R16)—Package of 5	1.00
11811	Resistor—680,000 ohms—Carbon type—¼ watt—(R10)—Package of 5	1.00
11980	Resistor—680,000 ohms—Carbon type—1/10 watt—(R3, R13)—Package of 5	.75
11981	Resistor—1.5 megohms—Carbon type—1/10 watt—(R14)—Package of 5	.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R9)—Package of 5	1.00
11603	Shield—Antenna or oscillator coil shield	.26
11390	Shield—Intermediate frequency transformer shield	.25
3529	Socket—Dial lamp socket	.32
11198	Socket—7-contact 6J7, 25Z6 or 25A6 Radiotron socket	.15
11196	Socket—8-contact 6H6, 6K7 or 6A8 Radiotron socket	.15
11614	Spring—Coil spring for large gears on variable tuning condenser—Package of 10	.70

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
11975	Switch—Range switch—(S1)	$0.95		**REPRODUCER ASSEMBLIES TABLE MODEL**	
11460	Switch—Tone control and power switch—(S2, S3)	.95	11827	Coil—Field coil—(L18)	$1.92
5238	Terminal—Antenna terminal board with clip insulating strip and rivets	.14	11235	Cone—Reproducer cone—(L16)—Package of 5	3.50
11976	Terminal—Ground terminal clip assembly	.15	5118	Connector—Three-contact male connector for reproducer	.25
11388	Transformer—First intermediate frequency transformer—(L12, L13, C20, C21)	1.90	5119	Connector—Three-contact female connector for reproducer cable	.25
11389	Transformer—Second intermediate frequency transformer—(L14, L15, C23, C24, C25, R7, R8)	3.02	11826	Reproducer complete	6.50
11391	Trap—Wave trap—(L1, C1)	1.22	11828	Transformer—Output transformer—(T1)	1.46
11237	Volume control—(R11)	1.20		**MISCELLANEOUS ASSEMBLIES**	
	REPRODUCER ASSEMBLIES CONSOLE MODEL		11823	Cord—Power cord and connector assembly	.65
11232	Board—Terminal board assembly	.18	11376	Escutcheon—Station selector escutcheon and crystal	.70
11231	Bolt—Yoke and core assembly bolt and nut	.16	11609	Knob—Range switch knob—Package of 5	.52
8060	Bracket—Output transformer mounting bracket	.14	11973	Knob—Station selector knob assembly—comprising one large and one small knob—Package of 5	.90
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25	11455	Knob—Volume control or tone control knob—Package of 5	.48
11827	Coil—Field coil—(L18)	1.92	11210	Screw—Chassis mounting screw assembly for Console Model—Package of 4	.28
11469	Coil—Neutralizing coil—(L17)	.20	11377	Screw—Chassis mounting screw assembly for Table Model—Package of 4	.12
11258	Cone—Reproducer cone complete—(L16)—Package of 5	3.85	11348	Screw—8-32 x 7/16" headless cupped-point set screw for small knob in Stock No. 11973—Package of 10	.32
5118	Connector—Three-contact male connector for reproducer	.25	11349	Spring—Retaining spring for knobs—Stock No. 11455 and No. 11609—Package of 5	.15
5119	Connector—Three-contact female connector for reproducer cable	.25	4982	Spring—Retaining spring for large knobs—Stock No. 11973—Package of 10	.26
11828	Transformer—Output transformer—(T1)	1.46			
11886	Washer—Spring washer—used to hold speaker field coil securely—Package of 5	.20			

The prices quoted above are subject to change without notice.

NOTES

(1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead at the antenna terminal. Interference in the form of "beats" from a combination of local stations may frequently be remedied by tuning the wave trap to one of the interfering stations.

(2) In the event that unsatisfactory service is obtained from the standard rectifier, an RCA type 25Z6-G may be used for replacement.

(3) Failures of capacitors C-37 or C-38 may produce hum. The rectifier tube should be replaced along with the capacitors.

RCA VICTOR MODELS T6-11 and C6-12

Six-Tube, Two-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
Broadcast Band (A) .... 540-1,850 kc.
Short-wave Band (B) ....1,850-6,900 kc.

ALIGNMENT FREQUENCIES
Band (A)......600 kc. (osc.), 1,720 kc. (osc., ant.)
Band (B)..............No Adjustments Required

Intermediate Frequency ....**460 kc.**

RADIOTRON COMPLEMENT
(1) RCA-6A8.............First Detector-Oscillator
(2) RCA-6K7.............Intermediate Amplifier
(3) RCA-6H6...........Second Detector-A.V.C.
(4) RCA-6F5............Audio Voltage Amplifier
(5) RCA-6F6.............Audio Power Amplifier
(6) RCA-5Z4.................Full-wave Rectifier

POWER SUPPLY RATINGS
Rating A ....105-125 Volts, 50-60 Cycles, 75 Watts
Rating B ....105-125 Volts, 25-60 Cycles, 75 Watts
Rating C ....100-130/140-160/195-250 Volts, 40-60 Cycles, 75 Watts

POWER OUTPUT RATINGS
Undistorted ....2.0 Watts
Maximum ....4.5 Watts

LOUDSPEAKER
Type ....Electrodynamic
Voice Coil Impedance.....2.25 Ohms at 400 Cycles

Mechanical Specifications

	Model T6-11	Model C6-12
Height	17 5/8 inches	36 1/4 inches
Width	13 1/4 inches	22 1/2 inches
Depth	8 1/4 inches	9 5/8 inches
Weight (Net)	21 pounds	37 pounds
Weight (Shipping)	25 pounds	48 pounds

Chassis Base Dimensions ....12 inches x 7 inches x 2 1/2 inches
Controls ....(1) Power Switch-Volume, (2) Tuning, (3) Tone, (4) Range Selector
Tuning Drive Ratio 6-to-1

General Features

These receivers each employ the same chassis and have many distinctive features. Model T6-11 employs an 8-inch dynamic loudspeaker and Model C6-12 employs a 12-inch dynamic loudspeaker. The new RCA All-Metal Radiotrons are employed in a superheterodyne circuit. The tuning ranges cover the standard broadcast band and extend above it to include the 49-meter short-wave broadcast band. The short-wave portion of this extensive range also includes the channels assigned for police, amateur, and aviation communication.

A high-ratio gang condenser drive is provided to facilitate accurate tuning. This feature is especially valuable for short-wave reception. The dial is clearly graduated and uniformly illuminated.

Automatic volume control is incorporated in the circuit to compensate for fluctuations of signal strength due to fading and variations of signal strength from station to station.

High-frequency tone control enables the listener to reduce high-frequency response as well as certain noises and static.

An adjustable wave trap, in parallel with the antenna input, serves to suppress code interference which may be encountered in certain localities from intermediate frequency radio telegraph signals.

Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A8. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (permeability tuned) wave trap is connected across the primary of this transformer to prevent signals of intermediate fre-

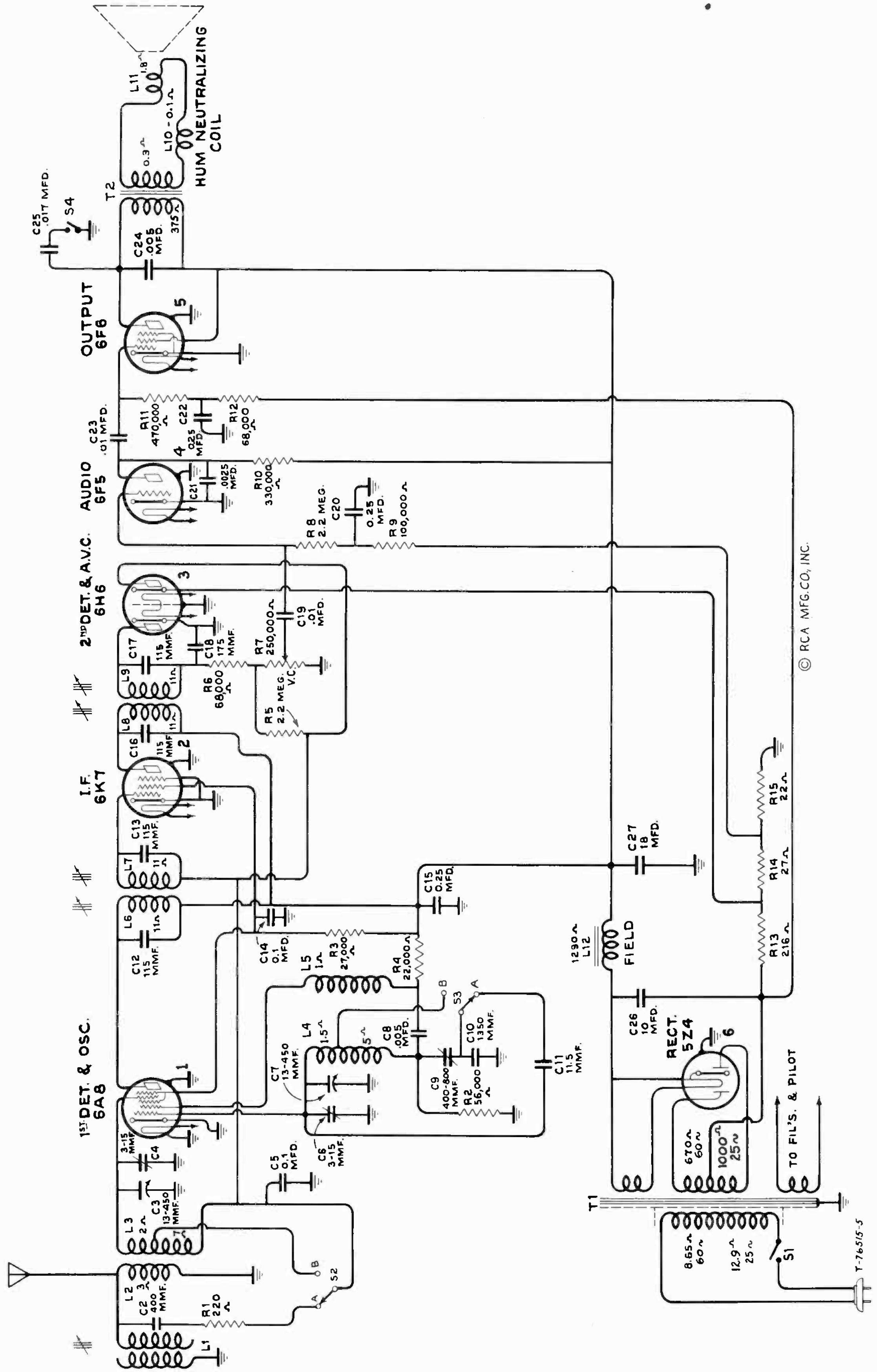


Figure 1—Schematic Circuit Diagram

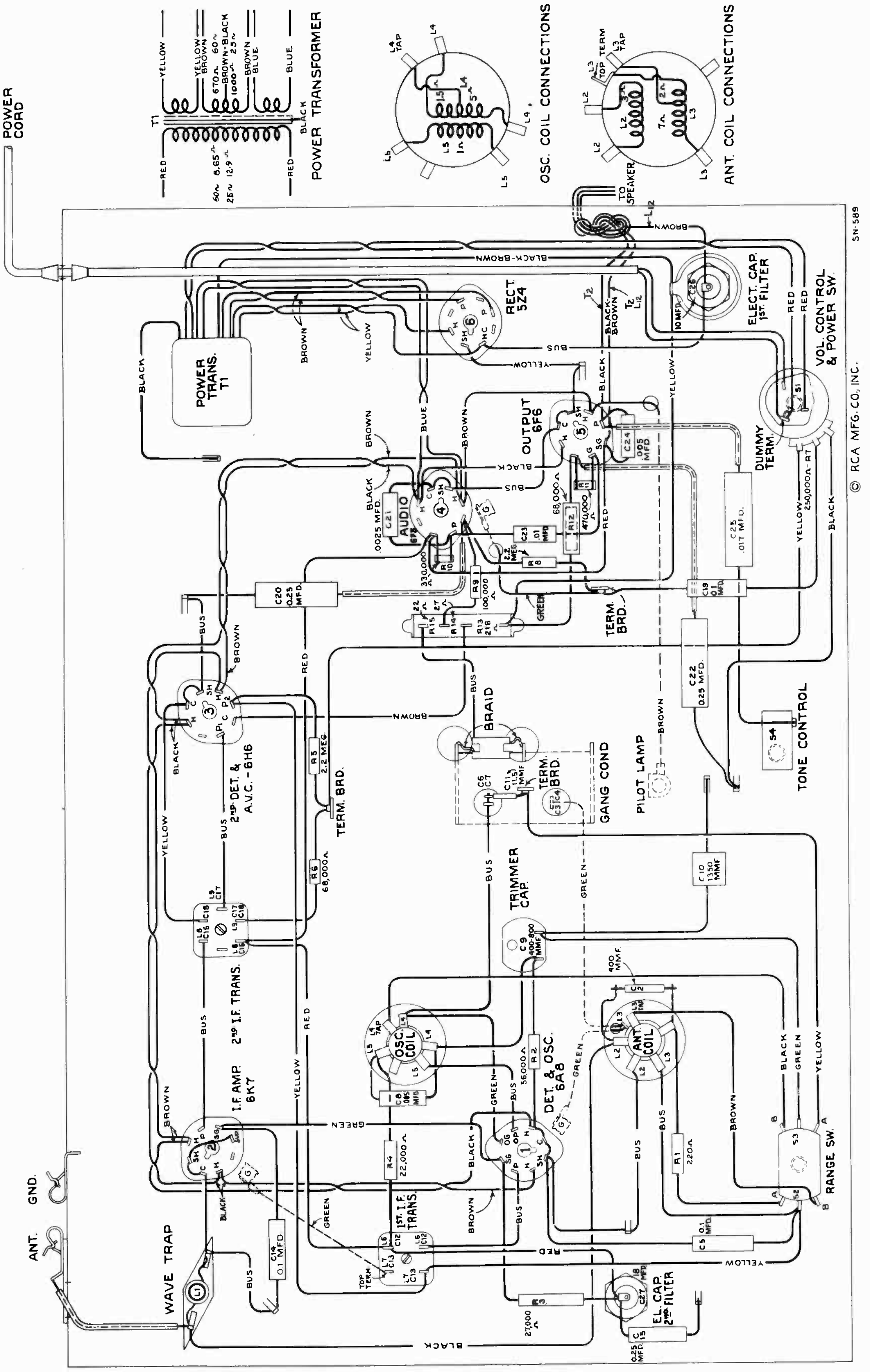


Figure 2—Chassis Wiring Diagram

quency (460 kc.) from being introduced into the first stage as interference. The two-section gang condenser, which tunes the antenna transformer secondary and the heterodyne oscillator coil, has adjustable trimmers for obtaining exact alignment. Each of these coils is tapped so that the range switch increases the range of tuning by decreasing the amount of inductance.

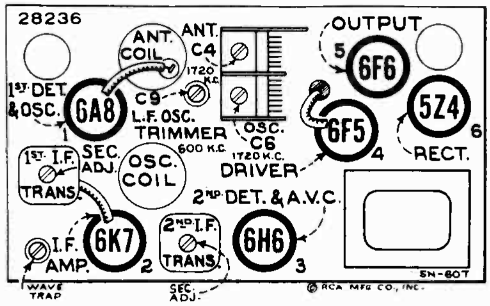


Figure 3—Radiotron and Coil Locations

The intermediate frequency stage is coupled to the RCA-6A8 and to the RCA-6H6 by means of tuned transformers. These transformers resonate with fixed capacitors and are tuned by molded cores to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 twin-diode tube. Audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across the volume control resistor R-7, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter. The second diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This auxiliary diode, under such conditions, draws current which flows through resistors R-5 and R-7, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-6F5, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-6F6 power output stage, which, in turn, is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch (S-4).

The power supply system consists of an RCA-5Z4 rectifier tube which is supplied from an efficiently designed power transformer and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits are obtained from the output of the filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation when such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are three alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of screws attached to molded cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

An oscillator (signal generator), **such as the RCA Stock No. 9595,** is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator

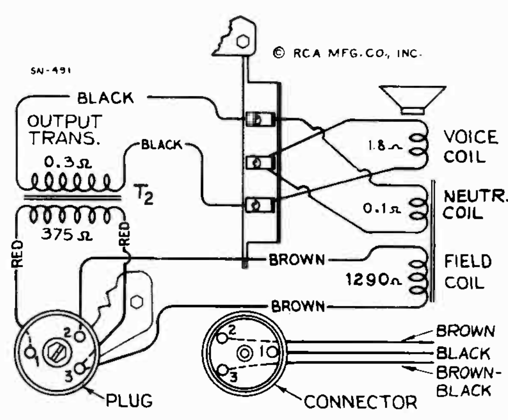


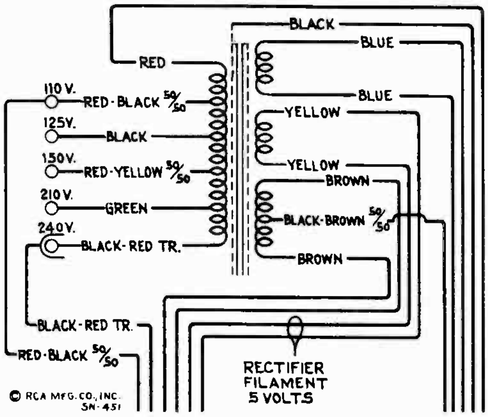
Figure 4—Loudspeaker Wiring

such as the RCA Stock No. 4317 Neon Output Indicator.

The following method of procedure should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Core Adjustments

The four adjustment screws (attached to molded cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by Figures 3 and 6. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker



Primary Resistance—24.5 ohms, Total
Secondary Resistance—670 ohms, Total

Figure 5—Universal Transformer

voice coil or across the output transformer primary. Connect the output of the test oscillator between the control grid of the RCA-6A8 and chassis ground. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered either from local broadcast stations or from the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is present on the output indicator. Then, adjust the two screws of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f screws to assure that the interaction between them has not disturbed the original adjustment.

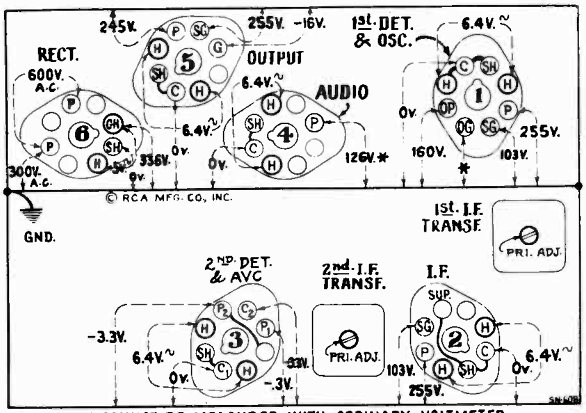
R-F Trimmer Adjustments

Calibrate the tuning dial by setting pointer to horizontal line at low-frequency end of broadcast band scale while variable condenser is at maximum capacity.

The output indicator should be left connected to the output system. Attach the output of the test oscillator between the antenna and ground terminals of the receiver input. Adjust the oscillator to 1,720 kc. and set the receiver tuning control to a dial reading of **1,720 kc.** Leave the volume control of the receiver at its maximum position. Make sure that the range selector is at its broadcast position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimmers, **C-6** and **C-4,** of the oscillator and antenna transformer coils (mounted on the variable condenser) so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator to **600 kc.** Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then, adjust the receiver oscillator series trimmer, **C-9,** simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at **1,720 kc.** should then be repeated to correct for any change which may have been caused by the oscillator series trimmer adjustment.

Radiotron Socket Voltages

Voltage values indicated at the Radiotron socket contacts on Figure 6 form a reference basis for test of the receiver. It is to be noted that all voltages are given with respect to chassis ground, excepting those appearing across the heaters (H-H). The values shown are obtainable when the receiver is in normal operating condition, with all tubes intact. They do not take into account inaccuracy caused by



* CANNOT BE MEASURED WITH ORDINARY VOLTMETER

Measured at 115 volts, 60 cycle supply

Figure 6—Radiotron Socket Voltages

the resistance of the voltmeter used for the tests, the lower the voltmeter resistance the lower the degree of accuracy. Allowance must, therefore, be made, dependent upon the type of test instrument used, for the loading effect of the voltmeter on the circuit.

Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap screw (core) to the point which causes maximum suppression of the interference.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43
11350	Cap—Grid contact cap—Package of 5	.20
11465	Capacitor—Adjustable capacitor—(C9)	.48
11450	Capacitor—11.5 Mmfd.—(C11)	.14
11998	Capacitor—115 Mmfd.—(C12, C13, C16, C17)	.28
11500	Capacitor—175 Mmfd.—(C18)	.18
4297	Capacitor—400 Mmfd.—(C2)	.30
11449	Capacitor—1,350 Mmfd.—(C10)	.26
5107	Capacitor—.0025 Mfd.—(C21)	.16
4868	Capacitor—.005 Mfd.—(C8, C24)	.20
4858	Capacitor—.01 Mfd.—(C19, C23)	.25
11451	Capacitor—.017 Mfd.—(C25)	.18
4840	Capacitor—.25 Mfd.—(C20, C22)	.30
5170	Capacitor—.25 Mfd.—(C15)	.25
4841	Capacitor—.1 Mfd.—(C5)	.22
4835	Capacitor—.1 Mfd.—(C14)	.28
11240	Capacitor—10 Mfd.—(C26)	1.08
5212	Capacitor—18 Mfd.—(C27)	1.16
11462	Coil—Antenna coil—(L2, L3)	1.85
11463	Coil—Oscillator coil—(L4, L5)	1.65
11457	Condenser—2-gang variable tuning condenser—(C3, C4, C6, C7)	3.46
12006	Core—Adjustable core for wave trap stock No. 12005 and i-f transformer stock Nos. 12002 and 12003	.22
11583	Dial—Station selector dial scale	.40
12042	Drive—Vernier drive for tuning condenser stock No. 11457	.35
11467	Indicator—Station selector indicator pointer	.10
5226	Lamp—Dial lamp—Package of 5	.70
12004	Resistor—Voltage divider resistor—comprising one 216-ohm, one 27-ohm, and one 22-ohm sections—(R13, R14, R15)	.45
11174	Resistor—220 ohms—carbon type—¼ watt—(R1)—Package of 5	1.00
8070	Resistor—22.000 ohms—carbon type—½ watt—(R4)—Package of 5	1.00
12011	Resistor—27.000 ohms—carbon type—1 watt—(R3)—Package of 5	1.10
5029	Resistor—56.000 ohms—carbon type—¼ watt—(R2)—Package of 5	1.00
12009	Resistor—68.000 ohms—carbon type—¼ watt—(R12)—Package of 5	1.00
12010	Resistor—68,000 ohms—carbon type—1/10 watt—(R6)—Package of 5	.75
3118	Resistor—100.000 ohms—carbon type—¼ watt—(R9)—Package of 5	1.00
11297	Resistor—330,000 ohms—carbon type—1/10 watt—(R10)—Package of 5	.75
11452	Resistor—470,000 ohms—carbon type—1/10 watt—(R11)—Package of 5	.75
11626	Resistor—2.2 megohms—carbon type—¼ watt—(R5, R8)—Package of 5	1.00
11464	Shield—Antenna or oscillator coil shield	.25
12008	Shield—Intermediate frequency transformer shield for stock No. 12002 and 12003	.28
8098	Socket—Dial lamp socket	.10
11195	Socket—5-contact 5Z4 Radiotron socket	$0.15
11198	Socket—7-contact 6K7, 6H6 or 6F5 Radiotron socket	.15
11196	Socket—8-contact 6A8 or 6F6 Radiotron socket	.15
12007	Spring—Retaining spring for adjustable core in stock Nos. 12002, 12003, 12005—Package of 10	.36
11461	Switch—Range switch—(S2, S3)	.56
12001	Switch—Tone control switch—(S4)	.30
5238	Terminal—Antenna terminal clip assembly	.14
12002	Transformer—First intermediate frequency transformer complete with shield—(L6, L7, C12, C13)	1.85
11999	Transformer—Power transformer, 105-125 volts, 50-60 cycles—(T1)	3.80
12132	Transformer—Power transformer, 105-125 volts, 25 to 50 cycles	5.48
12133	Transformer—Power transformer, 110-220 volts, 60 cycles	6.25
12003	Transformer—Second intermediate frequency transformer complete with shield—(L8, L9, C16, C17, C18)	2.05
12005	Trap—Wave trap—(L1)	1.20
12000	Volume control—Volume control and power switch—(R7, S1)	1.12
	MISCELLANEOUS ASSEMBLIES	
11455	Knob—Station selector, volume control, tone control or power switch knob—Package of 5	.48
11456	Screw—Chassis mounting screw assembly—for Model T6-11—Package of 2	.12
11586	Screw—Chassis mounting screw assembly—for Model C6-12—Package of 10	.22
11349	Spring—Retaining spring for knob stock No. 11455—Package of 5	.15
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board assembly with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
12012	Coil—Field coil—(L12)	1.85
11469	Coil—Neutralizing coil—(L10)	.20
11235	Cone—Reproducer cone—(L11)—Package of 5—(Table Model)	3.50
11258	Cone—Reproducer cone—(L11)—Package of 5—(Console Model)	3.85
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9638	Reproducer complete—(Table Model)	6.50
9639	Reproducer complete—(Console Model)	6.95
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20

The prices quoted above are subject to change without notice.

First Edition.

RCA VICTOR MODELS T7-12 and C7-14

Seven-Tube, Three-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

RADIOTRON COMPLEMENT
(1) RCA-6A8..................First Detector—Oscillator
(2) RCA-6K7....................Intermediate Amplifier
(3) RCA-6H6.................Second Detector—A.V.C.
(4) RCA-6F5..................Audio Voltage Amplifier
(5) RCA-6F6....................Audio Power Amplifier
(6) RCA-5Z4......................Full Wave Rectifier
(7) RCA-6E5.........................Tuning Indicator

FREQUENCY RANGES
Band A.............................. 540— 1,625 kc.
Band B.............................1,625— 5,700 kc.
Band C.............................5,700—18,000 kc.

ALIGNMENT FREQUENCIES
Band A............600 kc. (osc.), 1,400 kc. (osc., ant.)
Band B.................................None required
Band C..........................18,000 kc. (osc., ant.)

Intermediate Frequency..**460 kc.**

POWER SUPPLY RATINGS
Rating A...105—125 volts, 50—60 cycles, 90 watts
Rating B...105—125 volts, 25—60 cycles, 90 watts
Rating C.......................100—130/140—160/195—250 volts, 40—60 cycles, 90 watts

POWER OUTPUT
Undistorted...................................2.0 watts
Maximum.......................................4.5 watts

LOUDSPEAKER
Type.......................................Electrodynamic
Voice Coil Impedance............2.25 ohms at 400 cycles

Mechanical Specifications

Chassis Base Dimensions..........................12 inches x 7 inches x 2½ inches
Tuning Drive Ratio.....................................10 to 1 and 50 to 1

MODEL T7-12
Height...................................24⅝ inches
Width....................................14⅞ inches
Depth....................................11 inches
Weight (Net).............................24 pounds
Weight (Shipping)........................28 pounds

MODEL C7-14
Height...................................40⅞ inches
Width....................................26½ inches
Depth....................................13⅜ inches
Weight (Net).............................43 pounds
Weight (Shipping)........................55½ pounds

General Description

These two models are similar to RCA Victor Models T6-1 and C6-2 respectively. The changes consist of (1) the addition of an RCA-6E5 Tuning Indicator, (2) an RCA-5Z4 all-metal rectifier used in place of the RCA-80, and (3) new cabinet design. All service data for Models T6-1 and C6-2 are directly applicable to these instruments except as follows:

Secondary resistance of Universal Transformer, 355 ohms total.

Tuning Tube Cable voltages: Yellow, 0 v.; Brown, 6.4 v. a-c; Red, 263 v.; and Green, 0 v.

The following parts listed for Models T6-1 and C6-2 are not required: Stock Nos. 4841 (C23), 11615, 11376, 11396, 11283, 5158, 11383, 11458, 11585, 11584, and 11230.

The parts listed below are required in addition to the remaining parts for Models T6-1 and C6-2 :

Stock No.	Description	List Price
11996	Bracket—Tuning tube mounting bracket and clamp assembly..................	.22
11888	Cable—Tuning tube cable, complete with socket..........................	1.06
4836	Capacitor—.05 Mfd. (C35)............	.30
11894	Dial—Station selector dial scale.........	.65
11276	Escutcheon—Tuning tube escutcheon....	.40
11893	Indicator—Station selector indicator pointer	.28
11455	Knob—Volume control or power switch knob—Package of 5................	.48
11609	Knob—Range switch knob—Package of 5	.52
11610	Knob—Station selector knob assembly, comprising one large and one small knob—Package of 5................	1.00
11382	Resistor—1 megohm—carbon type—1/10-watt (R22)—Package of 5...........	.75
11626	Resistor—2.2 megohms—carbon type—¼-watt (R20, R21)—Package of 5....	1.00
11210	Screw—Chassis mounting screw assembly—Console model—Package of 4......	.28
11377	Screw—Chassis mounting screw assembly—Table model—Package of 4........	.12
11199	Socket—Dial lamp socket..............	.14
11381	Socket—Tuning tube socket and cover...	.45
11195	Socket—5-contact rectifier Radiotron socket	.15
11198	Socket—7-contact Radiotron socket......	.15
11196	Socket—8-contact Radiotron socket......	.15
11349	Spring—Retaining Spring for knob, Stock Nos. 11455 and 11609, and small knob in Stock No. 11610—Package of 5....	.15
4982	Spring—Retaining spring for large knob in Stock No. 11610—Package of 10...	.26
11848	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)............	4.40
11849	Transformer—Power transformer—105-125 volts—25-50 cycles..................	5.70
11850	Transformer—Power transformer—100-130—140-160—195-250 volts—40-60 cycles	8.00
11886	Washer—Spring washer used to hold field coil securely—Package of 5..........	.20

The prices quoted above are subject to change without notice.

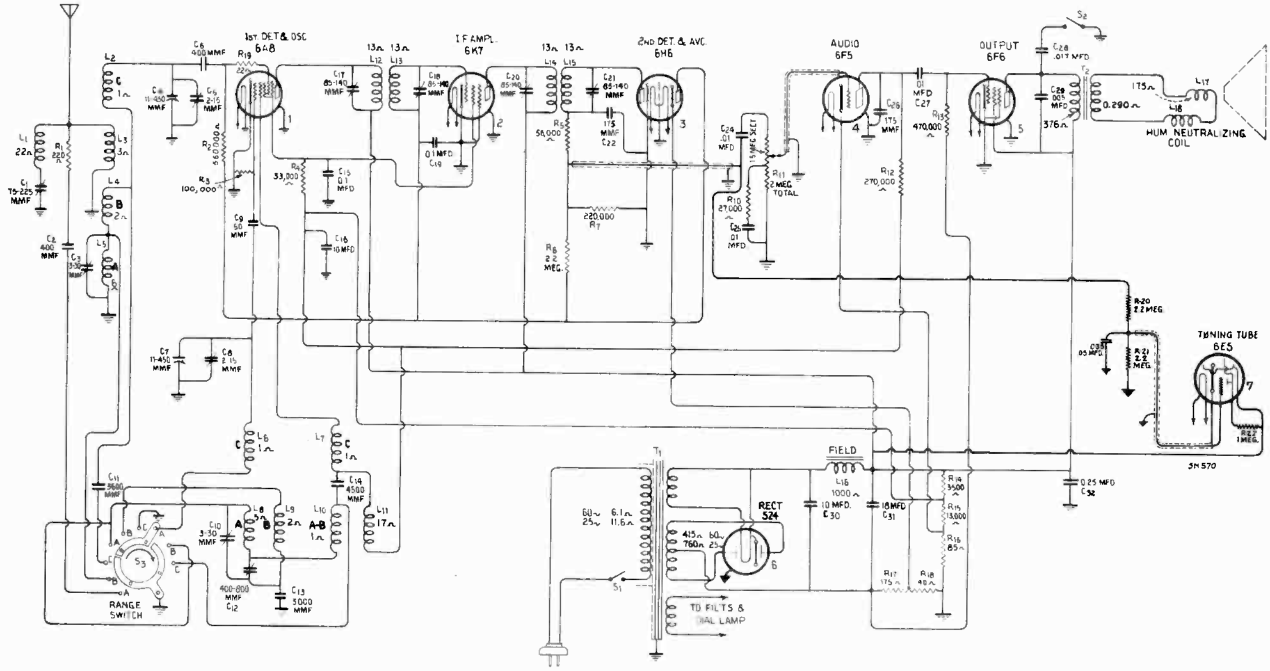


Figure 1—Schematic Circuit Diagram

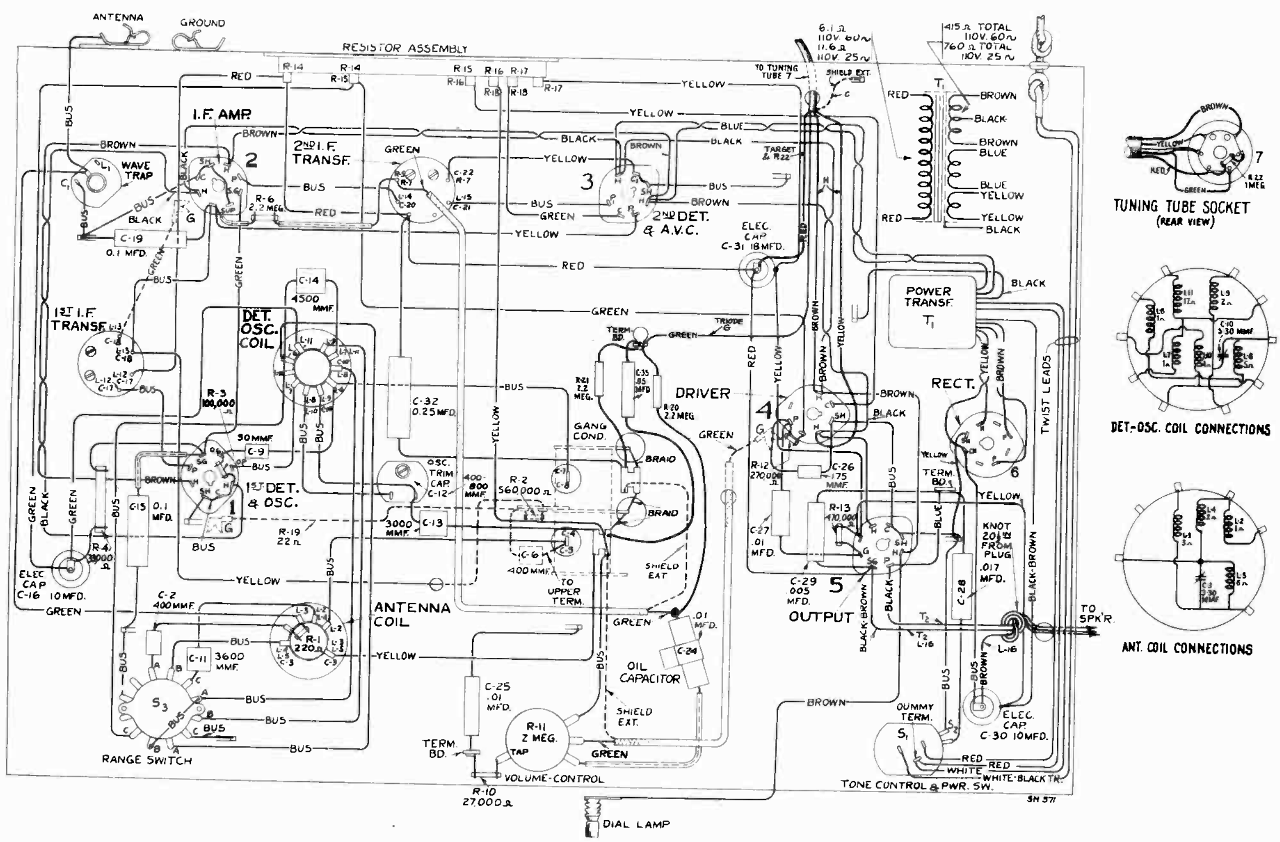


Figure 2—Chassis Wiring Diagram

First Edition

RCA VICTOR MODELS T8-18, C8-19, and C8-20

Eight-Tube, Three-Band, A-C, Superheterodyne Receivers

SERVICE NOTES

Electrical Specifications

Frequency Ranges
Band A .... 540- 1,625 kc.
Band B .... 1,625- 5,700 kc.
Band C .... 5,700-18,000 kc.

Alignment Frequencies
Band A...600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band B............................None required
Band C................18,000 kc. (osc., det., ant.)

Intermediate Frequency .... **460 kc.**

Radiotron Complement
(1) RCA-6K7..........Radio-Frequency Amplifier
(2) RCA-6A8.............First Detector-Oscillator
(3) RCA-6K7..............Intermediate Amplifier
(4) RCA-6H6............Second Detector-A.V.C.
(5) RCA-6F5.............Audio Voltage Amplifier
(6) RCA-6F6..............Audio Power Amplifier
(7) RCA-5Z4.................Full-Wave Rectifier
(8) RCA-6E5...................Tuning Indicator

Power Supply Ratings
Rating A ....105-125 Volts, 50-60 Cycles, 100 Watts
Rating B ....105-125 Volts, 25-60 Cycles, 105 Watts
Rating C ....100-130/140-160/195-250 Volts, 40-60 Cycles, 100 Watts

Power Output
Undistorted ....2.25 Watts
Maximum ....5.0 Watts

Loudspeaker
Type ....Electrodynamic
Voice Coil Impedance......2.25 ohms at 400 cycles

Mechanical Specifications

Tuning Drive Ratios ....10-to-1 and 50-to-1
Chassis Base Dimensions ....$13\frac{7}{8}$ inches x $7\frac{5}{8}$ inches x $2\frac{1}{2}$ inches

	Model T8-18	Model C8-19	Model C8-20
Height	$21\frac{1}{4}$ inches	39 inches	39 inches
Width	$15\frac{3}{4}$ inches	$25\frac{1}{4}$ inches	26 inches
Depth	$9\frac{1}{8}$ inches	$12\frac{1}{4}$ inches	$12\frac{3}{4}$ inches
Weight (Net)	$27\frac{1}{2}$ pounds	48 pounds	47 pounds
Weight (Shipping)	$33\frac{1}{2}$ pounds	63 pounds	62 pounds

Operating Controls ....(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch-Tone

General Description

These three models are similar to RCA Victor Models T7-5 and C7-6, except for the addition of an RCA-6E5 Tuning Indicator; and an RCA-5Z4 All-Metal Rectifier used in place of the RCA-80. An 8-inch dynamic speaker is used in the Table Model (T8-18), while the two Console Models (C8-19 and C8-20) each use a 12-inch dynamic speaker. The two Console Models differ only in cabinet design.

Service Data

All information contained in the Service Notes for RCA Victor Models T7-5 and C7-6 is directly applicable to these instruments except the Schematic Diagram, Wiring Diagram, and Replacement Parts. Other differences are as follows:

Secondary resistance of universal transformer, 265 ohms total.

Tuning tube cable voltages:

Yellow	Brown	Red	Green
0 v.	6.3 v. a-c	258 v.	0 v.

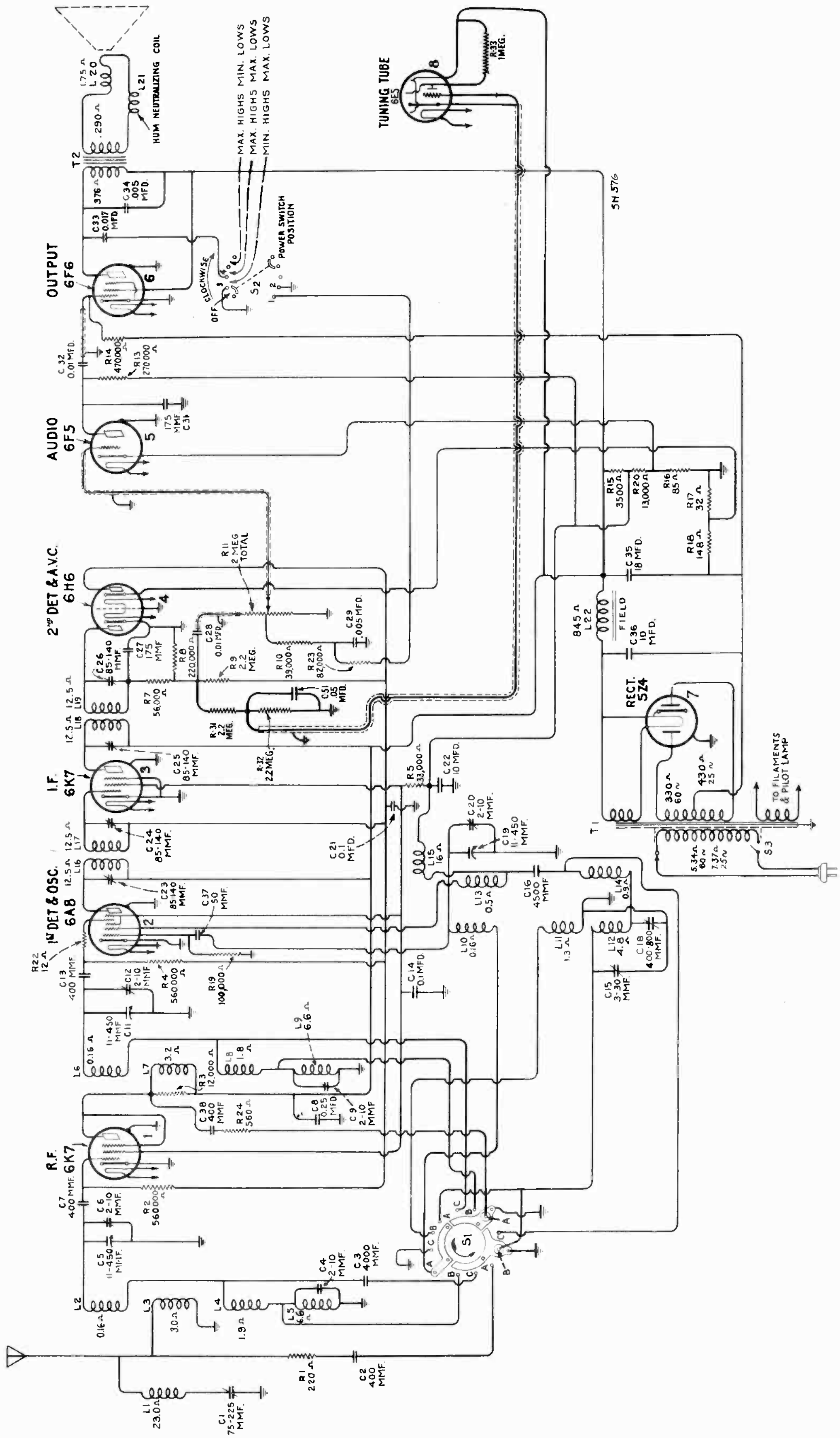


Figure 1—Schematic Circuit Diagram

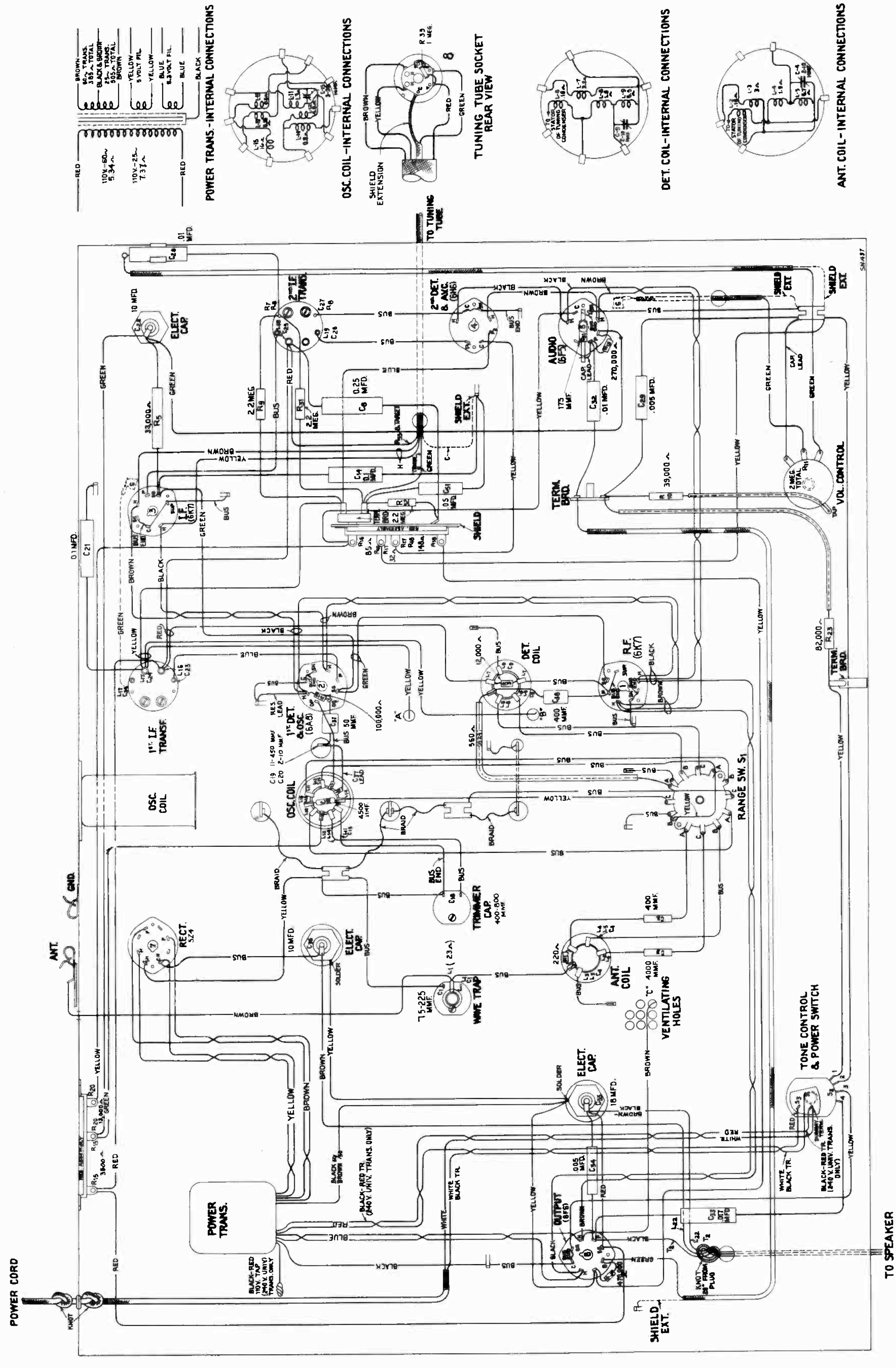


Figure 2—Chassis Wiring Diagram

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43
11625	Cable—Radiotron tuning tube cable complete with socket	1.26
11350	Cap—Contact cap—Package of 5	.20
11465	Capacitor—Adjustable capacitor—(C18)	.48
11289	Capacitor—50 MMfd.—(C37)	.26
5116	Capacitor—175 MMfd.—(C31)	.18
11623	**Capacitor—175 MMfd.—(C27)**	.18
11290	Capacitor—400 MMfd.—(C2, C7, C13, C38)	.25
11401	Capacitor—4000 MMfd.—(C3)	.38
4868	Capacitor—.005 Mfd.—(C29, C34)	.20
4906	Capacitor—.017 Mfd.—(C33)	.25
11395	Capacitor—.01 Mfd.—(C28)	.18
4858	Capacitor—.01 Mfd.—(C32)	.25
4839	Capacitor—0.1 Mfd.—(C14)	.28
4841	Capacitor—0.1 Mfd.—(C21)	.22
5170	Capacitor—0.25 Mfd. (C8)	.25
4886	Capacitor—.05 Mfd.—(C51)	.20
11240	Capacitor—10 Mfd.—(C36)	1.08
11387	Capacitor—10 Mfd.—(C22)	.86
5212	Capacitor—18 Mfd.—(C35)	1.16
5238	Clip—Antenna terminal board with clip, insulating strip and rivets	.14
11600	Coil—Antenna coil—(L2, L3, L4, L5, C4, R1)	1.78
11601	Coil—Detector coil—(L6, L7, L8, L9, C9, R3)	1.78
11602	Coil—Oscillator coil—(L10, L11, L12, L13, L14, L15, C15, C16)	2.15
11385	Condenser—Three-gang variable tuning condenser—(C5, C6, C11, C12, C19, C20)	5.02
11892	Dial—Station selector dial scale	.78
11613	**Drive—Variable tuning condenser drive**	**1.00**
11394	Foot—Chassis foot assembly—Package of 2	.70
11893	Indicator—Station selector indicator pointer	.28
5226	Lamp—Dial lamp—Package of 5	.70
11393	Resistor—Voltage divider resistor—comprising one 3,500 ohm and one 13,000 ohm sections—(R15, R20)	.74
11329	Resistor—Voltage divider resistor—comprising one 148 ohm, one 32 ohm and one 85 ohm sections—(R16, R17, R18)	.52
11369	Resistor—12 ohms—Flexible type complete with contact cap—(R22)	.22
11324	Resistor—560 ohms—Carbon type—¼ watt—(R24)—Package of 5	1.00
8072	Resistor—33,000 ohms—Carbon type—½ watt—(R5)—Package of 5	1.00
11322	Resistor—39,000 ohms—Carbon type—¼ watt—(R10)—Package of 5	1.00
11365	Resistor—82,000 ohms—Carbon type—¼ watt—(R23)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—(R19)—Package of 5	1.00
11323	Resistor—270,000 ohms—Carbon type—¼ watt—(R13)—Package of 5	1.00
11172	Resistor—470,000 ohms—Carbon type—¼ watt—(R14)—Package of 5	1.00
11397	Resistor—560,000 ohms—Carbon type—1/10 watt—(R2, R4)—Package of 5	.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R9, R31, R32)—Package of 5	1.00
11603	Shield—Antenna or detector coil shield	.26
11604	Shield—Oscillator coil shield	.24
11390	Shield—Intermediate frequency transformer shield	.25
11199	Socket—Dial lamp socket	.14
11195	Socket—5-contact rectifier Radiotron socket	.15
11198	Socket—7-contact 6K7—6F5—or 6H6 Radiotron socket	.15
11196	Socket—8-contact 6A8 or 6F6 Radiotron socket	.15
11386	Switch—Range switch—(S1)	1.16
11392	Switch—Tone control and power switch assembly—(S2, S3)	1.14
11388	Transformer—First intermediate frequency transformer—(L16, L17, C23, C24)	1.90
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C25, C26, C27, R7, R8)	3.02
11803	Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)	4.38
11804	Transformer—Power transformer—105-125 volts—25-50 cycles	6.02
11805	Transformer—Power transformer—105-130, 140-160, 195-250 volts—40-60 cycles	7.95
11391	Trap—Wave trap—(L1, C1)	1.22
11237	Volume control—(R11)	1.20
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket and clamp assembly	.22
11276	Escutcheon—Tuning tube escutcheon	.40
11376	Escutcheon—Station selector escutcheon and crystal	.70
11582	Knob—Range switch knob—Package of 5	.50
11610	Knob—Station selector knob assembly—comprising one small and one large knob—Package of 5	1.00
11347	Knob—Volume control or tone control knob—Package of 5	.75
11382	Resistor—1 megohm—Carbon type—1/10 watt—(R33)—Package of 5	.75
11210	Screw—Chassis mounting screw assembly—Console Model—Package of 4	.28
11377	Screw—Chassis mounting screw assembly—Table Model—Package of 4	.12
11381	Socket—Tuning tube socket and cover	.45
11349	Spring—Retaining spring for knobs, Stock No. 11347, No. 11582 and small knob in Stock No. 11610—Package of 5	.15
4982	Spring—Retaining spring for large knob in Stock No. 11610—Package of 10	.26

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	REPRODUCER ASSEMBLIES Table Model			**REPRODUCER ASSEMBLIES** Console Models	
11232	Board—Terminal board with two lead wire clips	.18	11232	Board—Terminal board assembly with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16	11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14	8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25	11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil—(L20)	2.00	11254	Coil—Field coil—(L20)	2.00
11233	Coil—Neutralizing coil—(L21)	.30	11233	Coil—Hum neutralizing coil—(L21)	.30
11235	Cone—Reproducer cone—(L22)—Package of 5	3.50	11258	Cone—Reproducer cone—(L22)—Package of 5	3.85
5119	Connector—3-contact female connector for reproducer cable	.25	5118	Connector—3-contact male connector for reproducer	.25
5118	Connector—3-contact male connector for reproducer	.25	5119	Connector—3-contact female connector plug for reproducer cable	.25
9618	Reproducer—Complete	6.40	9619	Reproducer—Complete	6.05
11253	Transformer—Output transformer—(T2)	1.56	11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20	11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current — in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

RCA VICTOR MODELS C9-4 and T9-10

Nine-Tube, Three-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

Band A	540-1,800 kc.
Band B	1,800-6,000 kc.
Band C	6,000-18,000 kc.

ALIGNMENT FREQUENCIES

Band A	600 kc. (osc.), 1,720 kc. (osc., det., ant.)
Band B	6,132 kc. (osc., det., ant.)
Band C	18,000 kc. (osc., det., ant.)

Intermediate Frequency.......**460 kc.**

RADIOTRON COMPLEMENT

(1) RCA-6K7..........Radio-Frequency Amplifier
(2) RCA-6L7..........First Detector
(3) RCA-6J7..........Heterodyne Oscillator
(4) RCA-6K7..........Intermediate Amplifier
(5) RCA-6H6..........Second Detector and A.V.C.
(6) RCA-6F5..........Audio Amplifier
(7) RCA-6F6..........Power Output Amplifier
(8) RCA-5Z4..........Full Wave Rectifier
(9) RCA-6E5..........Tuning Indicator

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycles, 105 watts
Rating B	105-125 volts, 25-60 cycles, 105 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 105 watts

LOUDSPEAKER

Type	Electrodynamic
Voice Coil Impedance	2¼ Ohms at 400 Cycles

POWER OUTPUT RATINGS

Undistorted	2 Watts
Maximum	4½ Watts

Mechanical Specifications

	Model C9-4	Model T9-10
Height	40 inches	22¼ inches
Width	26 inches	16½ inches
Depth	12½ inches	11¾ inches
Weight (Net)	57 pounds	34 pounds
Weight (Shipping)	72 pounds	39 pounds
Chassis Base Dimensions	14½ inches x 9 inches x 3½ inches	

General Description

These two models each employ the same type of chassis and are similar to the original RCA Victor Model C9-4. The main changes consist of the following: (1) An RCA-5Z4 metal rectifier is used in place of the RCA-5Z3 glass rectifier, and (2) a Speech-Music Control is added to the compensated volume control circuit and is actuated by the same knob as the power switch. The Console Model (C9-4) employs a 12-inch dynamic loudspeaker and the Table Model (T9-10) employs an 8-inch dynamic loudspeaker.

Service Data

All Service Data contained in the Service Notes for RCA Victor Model C9-4 are directly applicable to these instruments except the Schematic Diagram, Wiring Diagram, and Replacement Parts. Other differences not illustrated are as follows:

Universal Transformer d-c resistance (Figure 7 of C9-4 Service Note).

Primary Winding 17.3 ohms total.

Secondary Winding 400 ohms total.

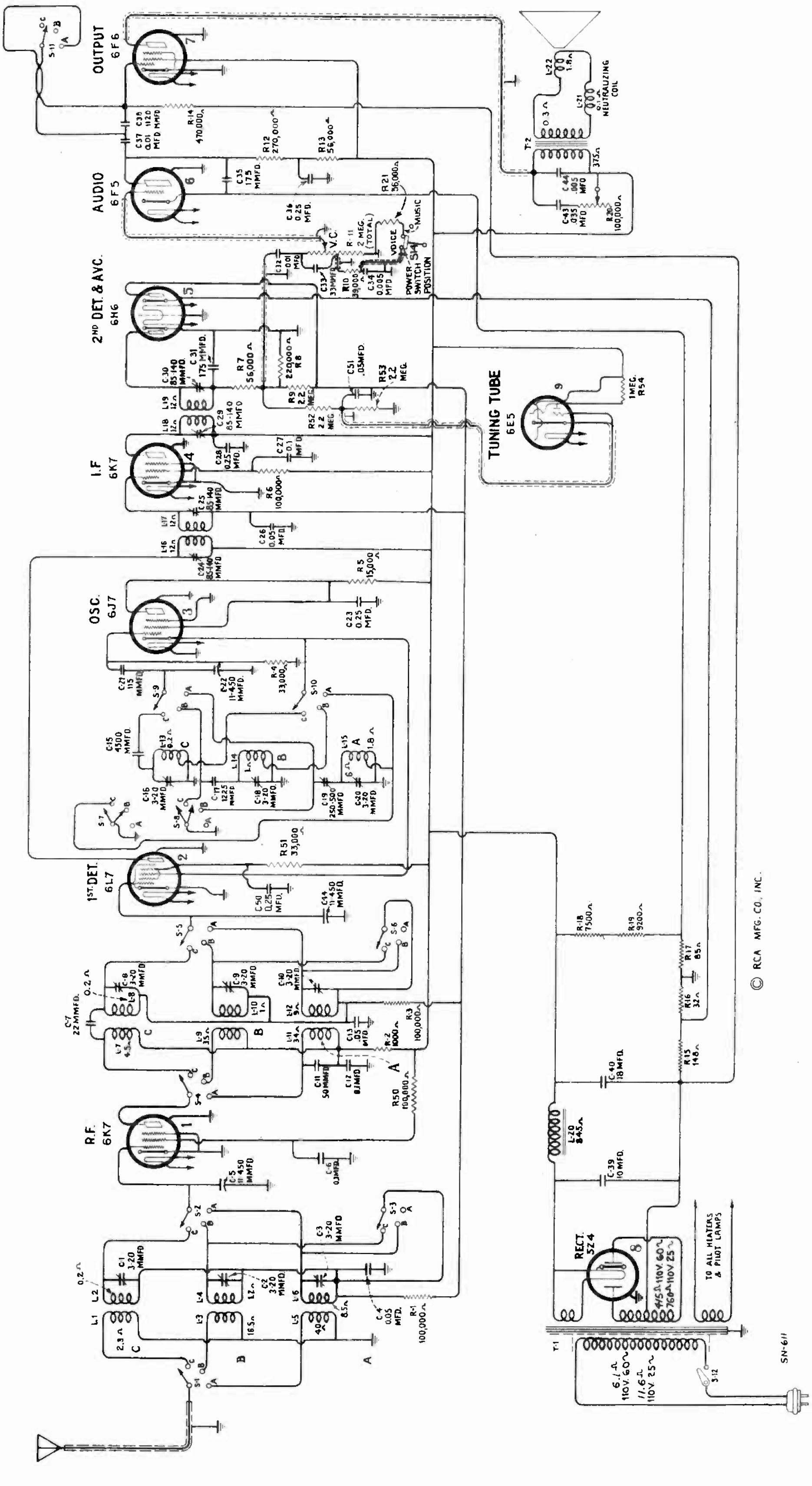


Figure 1—Schematic Circuit Diagram

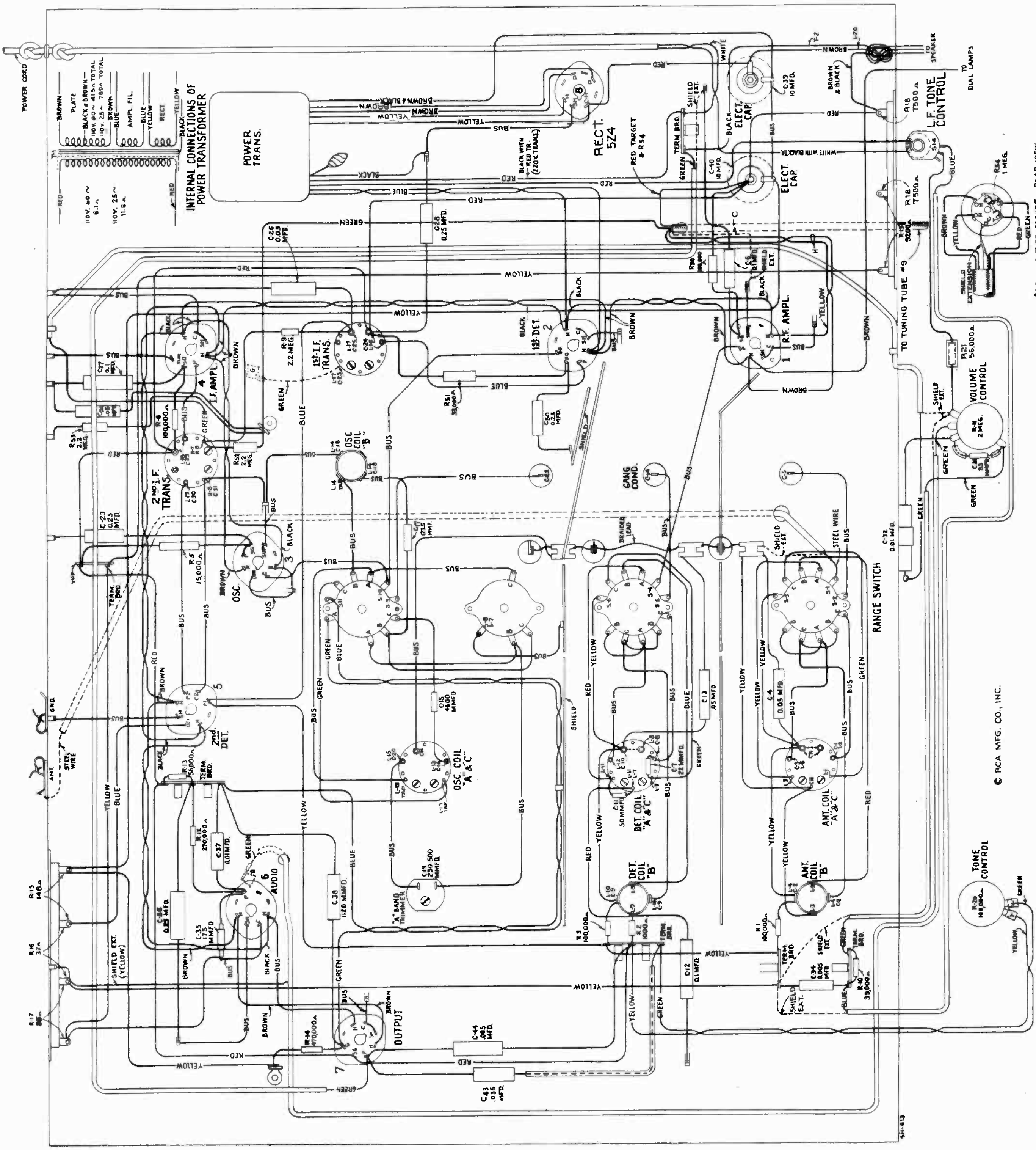


Figure 2—Chassis Wiring Diagram

REPLACEMENT PARTS

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

Stock No.	Description	List Price	Stock No.	Description	List Price
	RECEIVER ASSEMBLIES		11151	Resistor—2.2 megohms—Carbon Type—¼ watt—(R9, R52, R53)—Package of 5	1.00
4427	Bracket—Volume control or high frequency tone control mounting bracket	$0.18	5249	Shield—Antenna, detector or oscillator coil shield	.20
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	.43	5250	Shield—Intermediate frequency transformer shield	.22
11350	Cap—Contact cap—Package of 5	.20	11222	Socket—Dial lamp socket	.18
11223	Capacitor—Adjustable capacitor (C19)	.46	11195	Socket—5-contact rectifier radiotron socket	.15
11292	Capacitor—22 MMfd. (C7)	.24	11313	Socket—5-contact radiotron socket	.18
11321	Capacitor—33 MMfd. (C33)	.26	11198	Socket—7-contact radiotron socket	.15
11289	Capacitor—50 MMfd. (C11)	.26	11236	Switch—Band switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)	2.44
11291	Capacitor—115 MMfd. (C21)	.24	5224	Switch—Tone control and power switch (S12, S14)	1.00
11623	Capacitor—175 MMfd. (C31)	.18	5238	Terminal—Antenna terminal clip assembly	.14
5116	Capacitor—175 MMfd. (C35)	.18	11238	Tone Control—High frequency tone control (R20)	.96
4409	Capacitor—1120 MMfd. (C38)	.35	11216	Transformer—First intermediate frequency transformer (L16, L17, C24, C25)	2.15
11288	Capacitor—1225 MMfd. (C17)	.30	11239	Transformer—Second Intermediate frequency transformer (L18, L19, C29, C30, C31, R7, R8)	2.72
11287	Capacitor—4500 MMfd. (C15)	.30	11803	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	4.38
4868	Capacitor—0.005 Mfd. (C34, C44)	.20	11804	Transformer—Power transformer—105-125 volts—25-60 cycles	6.02
4624	Capacitor—0.01 Mfd. (C32)	.54	11805	Transformer—Power transformer—100-130, 140-160, 195-250 volts—40-60 cycles	7.95
4858	Capacitor—0.01 Mfd. (C37)	.25	11237	Volume Control—(R11)	1.20
5196	Capacitor—0.035 Mfd. (C43)	.18		DRIVE ASSEMBLIES	
4836	Capacitor—0.05 Mfd. (C4, C13, C26)	.30	4362	Arm—Band indicator operating arm	.28
4886	Capacitor—0.05 Mfd. (C51)	.20	10194	Ball—Steel ball—Package of 20	.25
4885	Capacitor—0.1 Mfd. (C6, C12, C27)	.28	4422	Clutch—Tuning condenser drive clutch assembly—comprising drive shaft, balls, ring, spring and washers—assembled	1.00
5170	Capacitor—0.25 Mfd. (C23, C28, C36, C50)	.25	11328	Dial—Dial scale	.68
11240	Capacitor—10 Mfd. (C39)	1.08	11252	Drive—Variable tuning condenser drive assembly	1.88
5212	Capacitor—18 Mfd. (C40)	1.16	4520	Indicator—Station selector indicator pointer	.18
11272	Clamp—Antenna cable clamp—Located near antenna terminal	.10	11226	Indicator—Band indicator pointer assembly—comprising indicator pointer, arm, link and stud	.20
5215	Coil—Antenna coil (A and C Bands)—(L1, L2, L5, L6, C1, C3)	2.32	3993	Screw—No. 6-32-5/32-in. square head set screw for band indicator operating arm—Package of 10	.25
5245	Coil—Antenna coil (B Band)—(L3, L4, C2)	1.58	4669	Screw—No. 8-32-5/32-in. set screw for variable condenser drive assembly—Package of 10	.25
5216	Coil—Detector coil (A and C Bands)—(L7, L8, L11, L12, C8, C10)	2.34	4377	Spring—Band indicator operating arm spring—Package of 5	.25
5246	Coil—Detector coil (B Band)—(L9, L10, C9)	1.62	4378	Stud—Band indicator operating arm stud and nut assembly—Package of 5	.25
5217	Coil—Oscillator coil (A and C Bands)—(L13, L15, C16, C20)	2.20		REPRODUCER ASSEMBLIES Table Model	
5247	Coil—Oscillator coil (B Band)—(L14, C18)	1.44	11232	Board—Terminal board with two lead wire clips	.18
11214	Condenser—3-gang variable tuning condenser (C5, C14, C22)	4.20	11231	Bolt—Yoke and core assembly bolt and nut	.16
4340	Lamp—Dial lamp—Package of 5	.60	8060	Bracket—Output transformer mounting bracket	.14
8041	Plate—R.F. or I.F. coil shield locking plate—Package of 2	.12	11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11244	Resistor—Voltage divider resistor, comprising one 7500 ohm and one 9200 ohm section—(R18, R19)	1.08	11254	Coil—Field coil (L20)	2.00
11329	Resistor—Voltage divider resistor, comprising one 148 ohm, one 32 ohm and one 85 ohm section—(R15, R16, R17)	.52	11233	Coil—Neutralizing coil (L21)	.30
5112	Resistor—1000 ohm—Carbon Type—¼ watt—(R2)—Package of 5	1.00			
5114	Resistor—15,000 ohm—Carbon Type—1 watt—(R5)	.22			
11300	Resistor—33,000 ohm—Carbon Type—1/10 watt—(R4)—Package of 5	.75			
5033	Resistor—33,000 ohm—Carbon Type—1 watt—(R51)—Package of 5	1.10			
11322	Resistor—39,000 ohm—Carbon Type—¼ watt—(R10)—Package of 5	1.00			
5029	Resistor—56,000 ohm—Carbon Type—¼ watt—(R13, R21)—Package of 5	1.00			
3118	Resistor—100,000 ohm—Carbon Type—¼ watt—(R1, R3, R6, R50)—Package of 5	1.00			
11323	Resistor—270,000 ohm—Carbon Type—¼ watt—(R12)—Package of 5	1.00			
11172	Resistor—470,000 ohm—Carbon Type—¼ watt—(R14)—Package of 5	1.00			

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price	Stock No.	Description	List Price
				MISCELLANEOUS ASSEMBLIES	
11235	Cone—Reproducer cone—(L22)—Package of 5	3.50	11996	Bracket—Tuning tube mounting bracket and clamp assembly	.22
5119	Connector—3-contact female connector for reproducer cable	.25	11331	Cable—Tuning lamp cable—complete with socket	1.28
5118	Connector—3-contact male connector for reproducer	.25	11276	Escutcheon—Tuning lamp escutcheon	.40
9618	Reproducer—Complete	6.40	11337	Escutcheon—Station selector escutcheon	.70
11253	Transformer—Output transformer (T2)	1.56	6614	Glass—Station selector dial glass	.30
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20	11346	Knob—Station selector knob—Package of 5	.75
	REPRODUCER ASSEMBLIES Console Models		11347	Knob—Volume control, tone control, range switch or power switch knob—Package of 5	.75
11232	Board—Terminal board assembly with two lead wire clips	.18	11246	Foot—Chassis mounting foot and bracket assembly—Package of 2	.76
11231	Bolt—Yoke and core assembly bolt and nut	.16	11382	Resistor—1 megohm—Carbon Type—1/10 watt (R54)—Package of 5	.75
8060	Bracket—Output transformer mounting bracket	.14	4678	Ring—Spring retaining ring for dial glass—Package of 5	.34
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25	5210	Screw—Chassis mounting screw assembly—for console model—Package of 4	.16
11254	Coil—Field coil (L20)	2.00	11210	Screw—Chassis mounting screw assembly—for table model—Package of 4	.28
11233	Coil—Hum neutralizing coil (L21)	.30	11348	Screw—No. 8-32-7/16-in. headless cupped point set screw for knob, Stock No. 11346—Package of 10	.32
11258	Cone—Reproducer cone—(L22)—Package of 5	3.85	11381	Socket—Tuning lamp socket and cover	.45
5118	Connector—3-contact male connector for reproducer	.25	11349	Spring—Retaining spring for knob, Stock No. 11347—Package of 5	.15
5119	Connector—3-contact female connector plug for reproducer cable	.25			
9619	Reproducer—Complete	6.05			
11253	Transformer—Output transformer (T2)	1.56			
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20			

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

RCA VICTOR MODELS C11-3, C13-3, AND C15-4
AND SUPPLEMENT TO
RCA VICTOR MODELS C11-1, C13-2, AND C15-3
TECHNICAL INFORMATION AND SERVICE DATA

With the exception of the cabinets, Models C11-3, C13-3, and C15-4 are respectively identical to Models C11-1, C13-2, and C15-3 (with metal rectifiers). Schematic and Wiring Diagrams for metal rectifier socket are shown by Figures 1 and 2. Other information is as follows:

Models C11-1 and C11-3 (with metal rectifier).
Service Data for Model C11-1 are directly applicable to these instruments, except the parts listed below as Substitute and Additional Replacement Parts. Replacement Part changes applying to all Models C11-1 and C11-3 are:
(1) Change description of Stock No. 8053 to read:
Indicator—Station selector vernier indicator pointer.
(2) Capacitor C24 should be replaced with Stock No. 4886 instead of Stock No. 4858.
(3) Add Stock Nos. 4886, 11710, and 11793 as listed below.

Models C13-2 and C13-3 (with metal rectifier).
Service Data for Model C13-2 are directly applicable to these instruments, except the parts listed below as Substitute and Additional Replacement Parts. Replacement Part changes applying to all Models C13-2 and C13-3 are:
(1) Change description of Stock No. 8053 to read:
Indicator—Station selector vernier indicator pointer.
(2) Capacitor C60 should be replaced with Stock No. 4886 instead of Stock No. 4883.
(3) Add Stock Nos. 4886, 11710, and 11793 as listed below.

Models C15-3 and C15-4 (with metal rectifier).
Service Data for Model C15-3 are directly applicable to these instruments, except the parts listed below as Substitute and Additional Replacement Parts. Replacement Part changes applying to all Models C15-3 and C15-4 are:
(1) Change description of Stock No. 8053 to read:
Indicator—Station selector vernier indicator pointer.
(2) Capacitor C47 should be replaced with Stock No. 4870 instead of Stock No. 4858.
(3) Add Stock Nos. 4870, 11710, and 11793 as listed below.

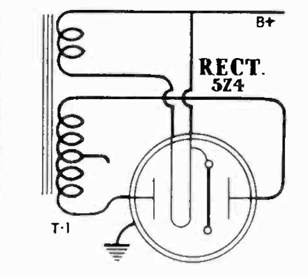


Figure 1

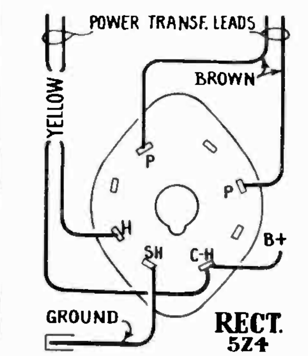


Figure 2

SUBSTITUTE AND ADDITIONAL REPLACEMENT PARTS

	Stock No.	Description	List Price
MODELS C11-1 C11-3 (with metal rectifier)	4886	Capacitor—.05 Mfd. (C24)	.20
	11710	Lead—Shielded antenna lead	.40
	11195	Socket—5-contact rectifier Radiotron socket	.15
	11793	Indicator—Station selector indicator pointer	.15
		Stock Nos. 4858, 11273, and 4794 are not used in chassis having metal rectifier.	
MODELS C13-2 C13-3 (with metal rectifier)	4886	Capacitor—.05 Mfd. (C60)	.20
	11710	Lead—Shielded antenna lead	.40
	11195	Socket—5-contact rectifier Radiotron socket	.15
	11880	Transformer—Power transformer—105-125 volts 50-60 cycles (T1)	5.80
	11887	Transformer—Power transformer—105-125 volts 25-50 cycles	6.95
	11251	Transformer—Power transformer—105/125/150/210/250 volts 40-60 cycles	11.35
	11793	Indicator—Station selector indicator pointer	.15
		Stock Nos. 4883 (C60), 11273, 4794, 8061, 8062, and 11194 are not used in chassis having metal rectifier.	
MODELS C15-3 C15-4 (with metal rectifier)	4870	Capacitor—.025 Mfd. (C47)	.20
	11710	Lead—Shielded antenna lead	.40
	11195	Socket—5-contact rectifier Radiotron socket	.15
	11880	Transformer—Power transformer—105-125 volts 50-60 cycles (T1)	5.80
	11887	Transformer—Power transformer—105-125 volts 25-50 cycles	6.95
	11251	Transformer—Power transformer—105/125/150/210/250 volts 40-60 cycles	11.35
	11793	Indicator—Station selector indicator pointer	.15
		Stock Nos. 4858 (C47), 11273, 4794, 8061, 8062, and 11194 are not used in chassis having metal rectifier.	

The prices quoted above are subject to change without notice.

RCA VICTOR DIVISION
RCA Manufacturing Company, Inc.
CAMDEN, N. J., U. S. A.

RCA VICTOR MODEL D8-28

Eight-Tube, Three-Band, A-C, Radio-Phonograph

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

Band A	540- 1,625 kc.
Band B	1,625- 5,700 kc.
Band C	5,700-18,000 kc.

ALIGNMENT FREQUENCIES

Band A	600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band B	None required
Band C	18,000 kc. (osc., det., ant.)

Intermediate Frequency .... **460 kc**

RADIOTRON COMPLEMENT

(1)	RCA-6K7	Radio-Frequency Amplifier
(2)	RCA-6A8	First Detector-Oscillator
(3)	RCA-6K7	Intermediate Amplifier
(4)	RCA-6H6	Second Detector-A.V.C.
(5)	RCA-6F5	Audio Voltage Amplifier
(6)	RCA-6F6	Audio Power Amplifier
(7)	RCA-5Z4	Full-Wave Rectifier
(8)	RCA-6E5	Tuning Indicator

POWER SUPPLY RATINGS

Rating A	105-125 Volts, 50-60 Cycles, 135 Watts
Rating B	105-125 Volts, 25 Cycles, 135 Watts
Rating C	105-130/140-160/200-250 Volts, 50-60 Cycles, 135 Watts

LOUDSPEAKER

Type	12-inch Electrodynamic
Voice Coil Impedance	2¼ Ohms at 400 Cycles

POWER OUTPUT RATINGS

Undistorted	2¼ Watts
Maximum	5 Watts

PHONOGRAPH

Type	Manual
Turntable Speed	78 R.P.M.
Type of Pickup	Improved Low-Impedance Magnetic
Pickup Impedance	7 Ohms at 1,000 Cycles

Mechanical Specifications

Height	42⅛ inches
Width	22⅞ inches
Depth	14⅞ inches
Weight (Net)	82 pounds
Weight (Shipping)	144 pounds
Chassis Base Dimensions	13⅞ inches x 7⅝ inches x 2½ inches

General Description

The RCA Victor Model D8-28 combination instrument consists of an eight tube radio receiver and a manually operated phonograph combined in the one cabinet. An improved 12-inch dynamic loudspeaker provides excellent reproduction and readily handles the high level of sound energy obtainable from the output of this instrument.

Magic Brain

The radio receiver incorporates the Junior "Magic Brain" which is a scientifically correct co-ordination of all the parts of the r-f, oscillator, and first detector functions of a Superheterodyne Receiver. This arrangement provides greater efficiency, especially in the short-wave ranges, as all lead lengths are kept as short as possible and all sockets and other parts are located for best possible operation.

Magic Eye

A cathode-ray tube whose fluorescent screen has the appearance of a human eye, is used for visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design. It contains two groups of elements; one group operates as an amplifier and the other group operates as a cathode-ray tube.

The cathode-ray section consists of a conically shaped luminescent screen, a cathode, and a control electrode. The detected signal from the receiver is applied through the amplifier section of the tuning tube to the control electrode of the cathode-ray section. This control electrode, in turn, affects the electron stream emitted by the cathode in such a manner as to cause a triangular shadow on the luminescent screen. The size of the shadow caused by the control electrode is determined by the strength of the incoming signal, so that a change-of-tuning is readily exhibited on the cathode-ray screen, and therefore, tuning to exact resonance can be definitely obtained.

RCA All-Metal Tubes

The new metal tubes are used in the radio receiver for amplifying and detecting purposes. These tubes make possible a greater range of stable amplification not previously attainable with corresponding glass types. Their metal envelopes form a perfect electrostatic and electromagnetic shield, precluding the former necessity for elaborate shielding by means of cans. The metal tubes are especially adaptable to the modern, extended-range receivers because of their efficient shielding and their favorable internal characteristics.

Phonograph Mechanism

An improved manually operated phonograph mechanism is used in this model. The 12-inch turntable will accommodate either the 10-inch or the 12-inch phonograph records. The turntable rotates at a speed of 78 r.p.m. A speed regulator is provided for accurate adjustment of this speed. The instrument may be purchased with any one of three ratings as specified under Electrical Specifications. *It is important that a machine of any particular rating be operated at the frequency and voltage for which it is rated.* Attempts to operate at ratings other than specified for the particular instrument may result in damage to both the phonograph motor and the radio receiver. An automatic switch is provided to turn "off" the phonograph motor at the completion of record play when the eccentric-type inside groove record is used.

Tuning Dial

The tuning dial is an illuminated semi-airplane type. Each band is distinctively marked with a separate color for each band. Positions of the range selector knob are plainly marked on the control panel with letters indicating each band position placed over color strips corresponding to the band colors on the dial. The tuning control is of the dual-ratio type which permits fast tuning through a 10-to-1 drive ratio and vernier tuning through a 50-to-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations. The new shock-proof condenser mounting reduces microphonic tendencies to a minimum.

Circuit Arrangement

The conventional Superheterodyne type of circuit, consisting of an r-f stage, a combined first-detector–oscillator stage, a single i-f stage, a diode-detector–automatic-volume-control stage, an audio voltage amplifier stage, an audio power output stage and a high-voltage rectifier power-supply stage, is used.

Tuned Circuits

The antenna coil system and the detector coil system each consist of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-9, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio-voltage-amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first audio stage and the power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of the output tube. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S-2).

Rectifier

The power required for operation of this receiver is supplied through transformer T-1. This transformer has an efficient electrostatic shield between its primary and secondary windings. This shield prevents interference which is on the power-supply circuit from entering the receiver and conversely reduces the tendency of the receiver to re-radiate into the power circuit. An RCA-5Z4 furnishes the d-c voltages necessary for plate, screen, cathode, and grid potentials. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current. The heaters of all Radiotrons are supplied from a low voltage (6.3 volt) winding on the power transformer. One side of this winding is at ground potential.

SERVICE DATA

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistances of less than one ohm are generally omitted.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system, two in the detector coil system, and two in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment, illustrated and described on a separate page of this booklet, may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. **The RCA Victor Stock No. 9595 Full-Range Oscillator and the RCA Victor Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.**

The following procedure should be followed in adjusting the various trimmer capacitors:

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 6. Each must be aligned to a basic frequency of 460 kc. To do this, attach the Output Indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator between the control-grid of the RCA-6A8 first detector tube and chassis-ground. Tune the oscillator to 460 kc. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, C-25 and C-26, of the second i-f transformer to produce maximum (peak)

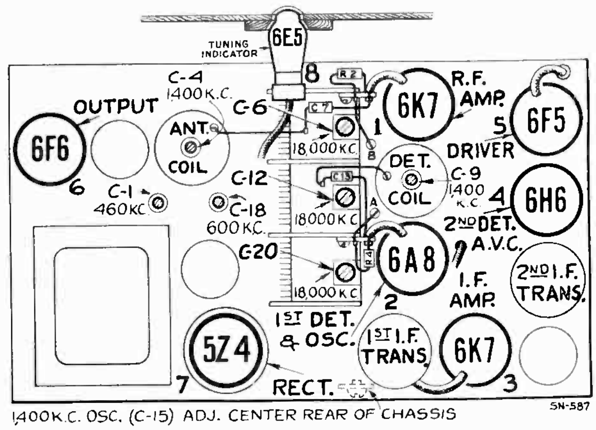


Figure 1—Radiotron and Coil Locations

indicated receiver output. Then, adjust the two trimmers, C-23 and C-24, of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the inter-action between them has not disturbed the original adjustment.

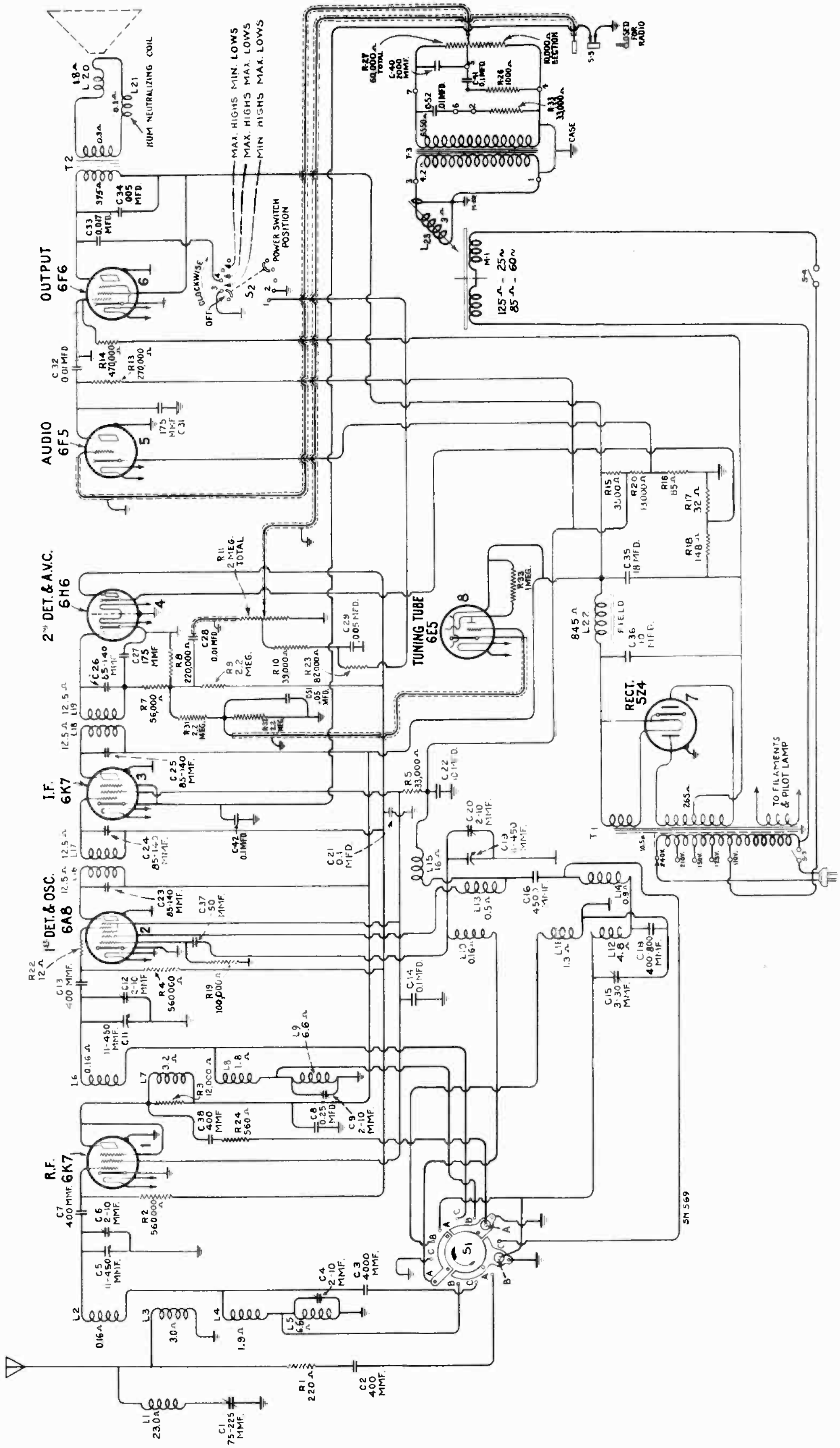


Figure 2—Schematic Circuit Diagram

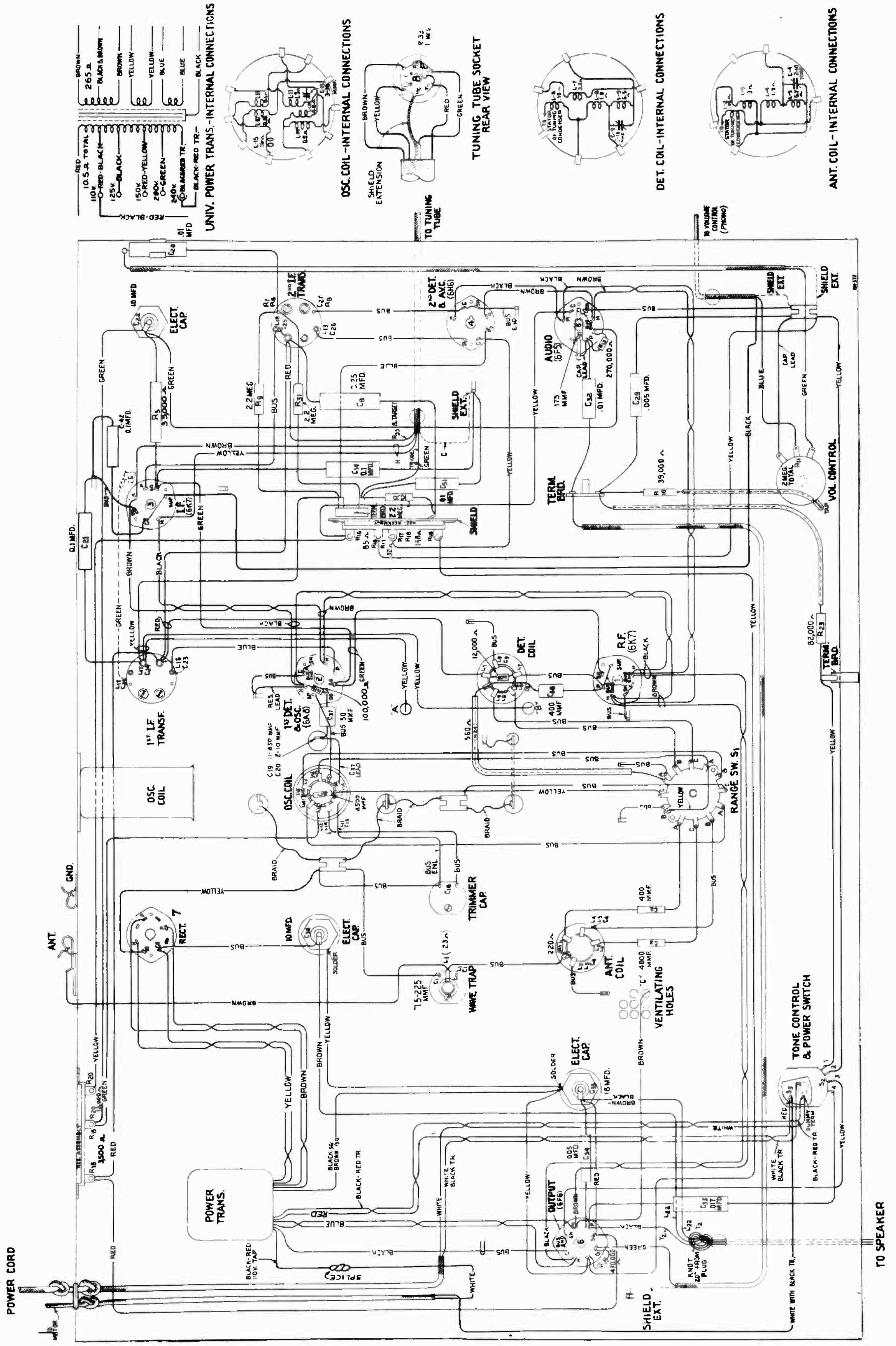


Figure 3—Chassis Wiring Diagram

R-F Trimmer Adjustments

The seven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by Figure 1. The three trimmers which are at all times directly in shunt with the variable tuning condenser necessitate that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The Output Indicator should be left connected to the output system. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the ***horizontal*** graduation (530 kc.) at the low frequency end of the Band A scale.

Proceed further as follows:

(a) Adjust the test oscillator to **18,000 kc.** and set the receiver tuning control to a dial reading of **18,000 kc.**

(b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer, **C-20,** on the

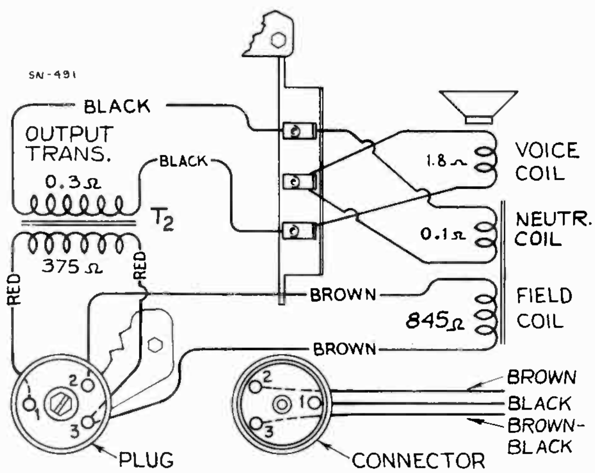


Figure 4—Loudspeaker Wiring

oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of ***maximum trimmer capacitance*** is correct and should be used. (The oscillator will be **460 kc.** below the signal frequency at this adjustment point.)

(c) Adjust the trimmer, **C-12,** of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **18,000 kc.** input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment which would otherwise be caused by the inter-action between the heterodyne oscillator circuit and the detector tuned circuit.

(d) With the receiver tuning control set to **18,000 kc.** adjust the trimmer, **C-6,** on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.

(e) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of **1,400 kc.** Tune the test oscillator to **1,400 kc.** and regulate its output to produce a slight indication on the receiver output indicating device.

(f) Adjust the high frequency trimmers of the Band A oscillator, detector, and antenna coils, **C-15, C-9,** and **C-4** respectively, to the points at which each produces maximum indicated receiver output.

(g) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(h) Tune the low frequency trimmer, **C-18,** of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of **C-20, C-12,** and **C-6** should be corrected at **18,000 kc.** as in (b), (c), and (d); also **C-15, C-9,** and **C-4** should be corrected at **1,400 kc.** as in (f) to compensate for any changes caused by the adjustment of the low frequency oscillator coil trimmer.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to chassis on Figure 6 will assist in the location of causes for faulty operation. Each value as specified should hold within $\pm$ 20% when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

Standard Transformer

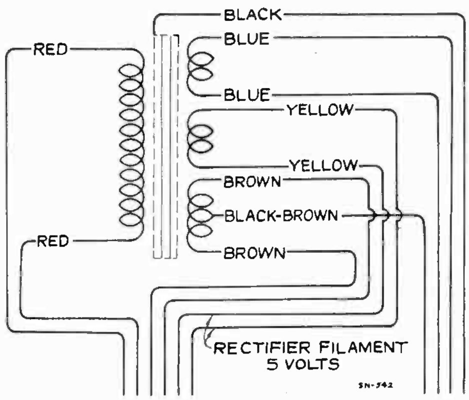
The transformer used on some models of this instrument is adaptable for voltages and frequencies as given under Ratings A and B of Electrical Specifications. Its schematic and wiring are shown by Figure 5.

Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference. This trimmer is adjusted to 460 kc. during manufacture, however, local conditions may require a readjustment, depending upon the interfering frequency.

Phonograph Mechanism

The phonograph motor is of the governor induction type and designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in Figure 9. Application of oil to the felt pad which rubs against the governor disc will insure smooth operation.



110 Volt—60 Cycle	110 Volt—25 Cycle
Pri. Res. 5.34 ohms, total	Pri. Res. 7.37 ohms, total
Sec. Res. 330 ohms, total	Sec. Res. 430 ohms, total

Figure 5—Standard Power Transformer Connections

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design, having several variations from the usual type of pickup. The magnetic assembly is one rigid piece. The horseshoe magnet is solidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and provides a damping effect on the movement of the armature. The frequency response is uniform over a wide range.

Service operations which may be necessary on the pickup are as follows:

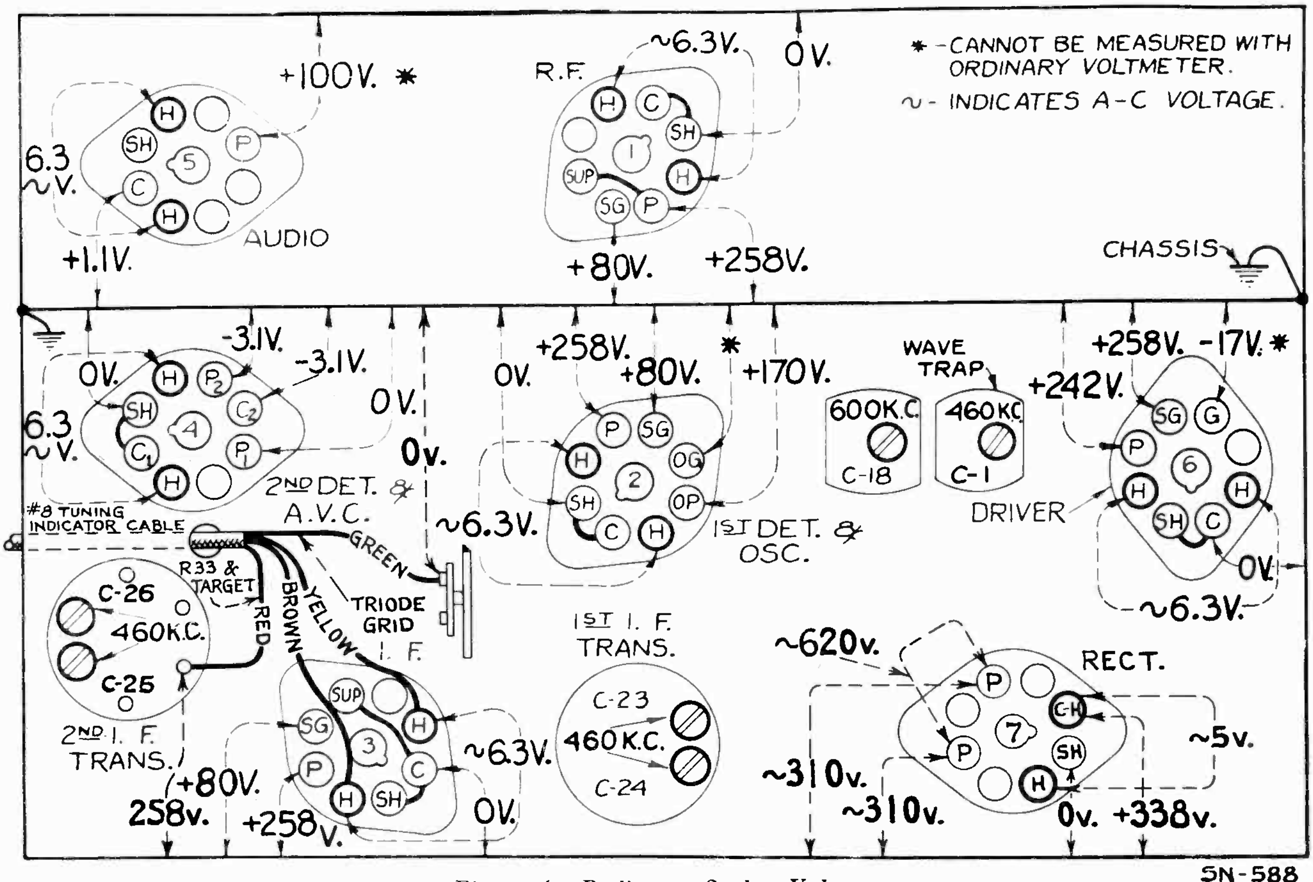


Figure 6—Radiotron Socket Voltages

Measured at 115 volts, 60 cycles—No signal input

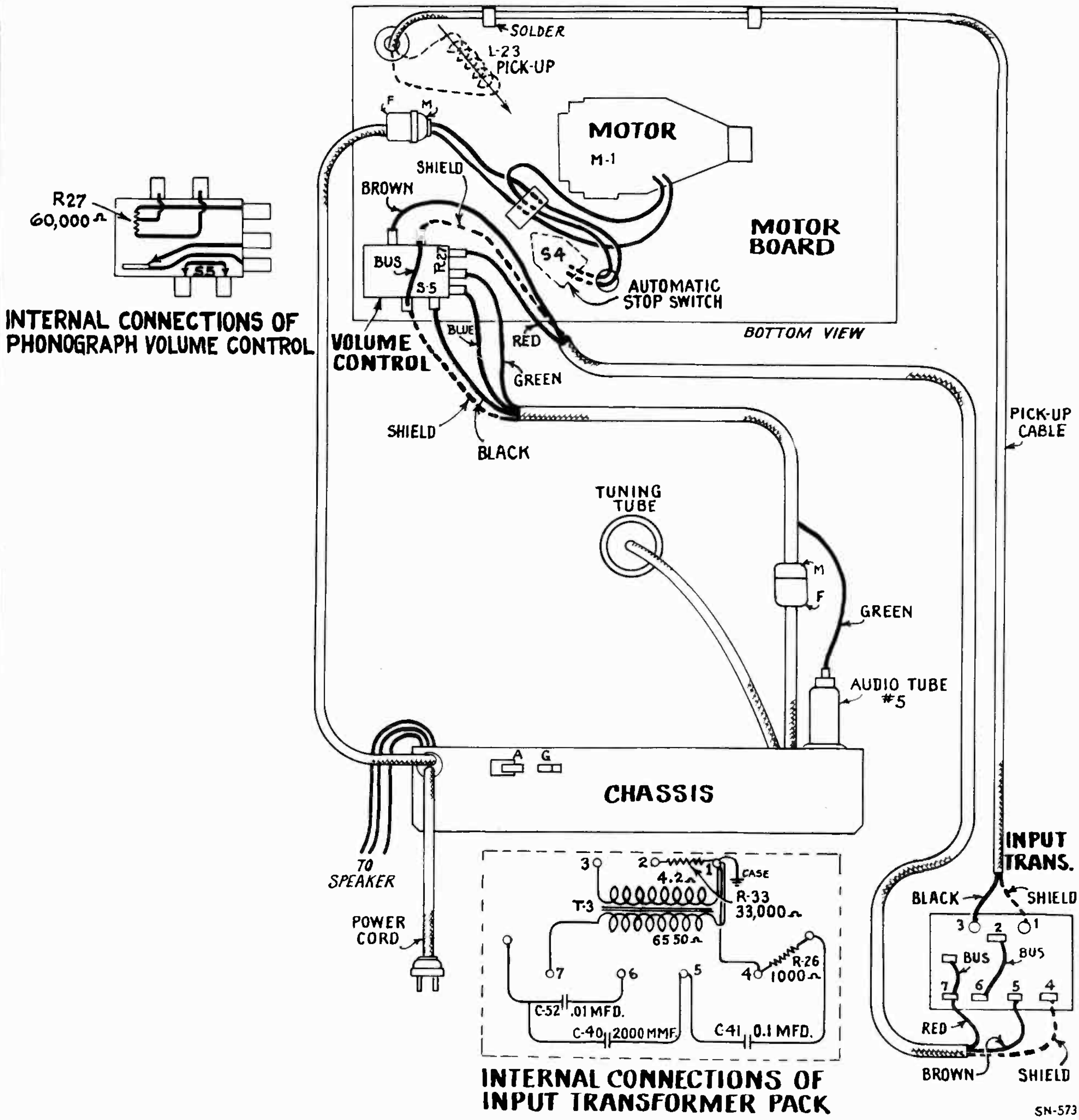


Figure 7—Assembly Wiring

Centering Armature

Refer to Figure 8 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i. e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened

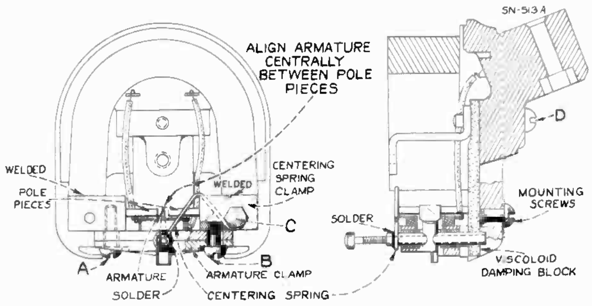


Figure 8—Details of Pickup

and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly cleaned with fine emery cloth. Then insert the new block so that it occupies the same position as it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw

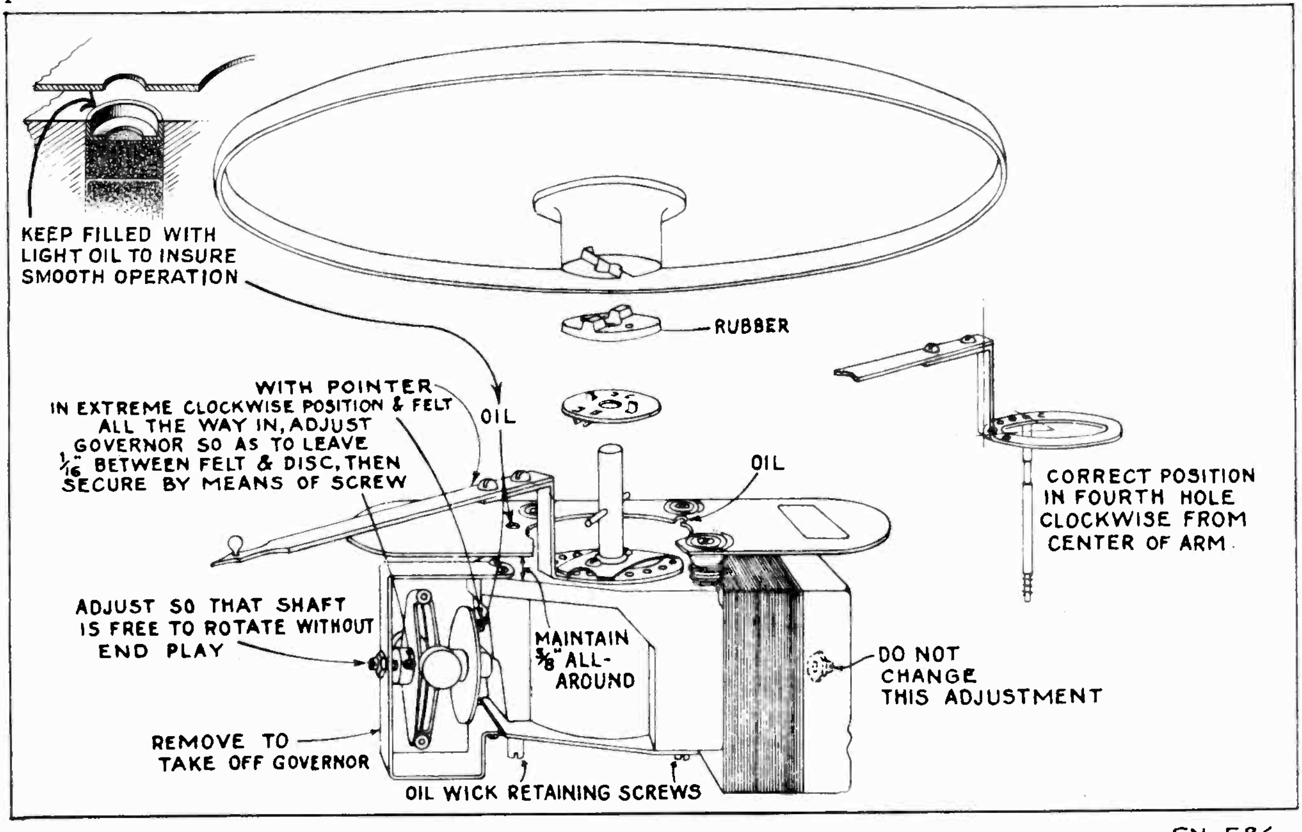


Figure 9—Motor Details

SN-586

D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in Figure 10 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to readjust the armature as previously explained after re-assembly of the mechanism. Only rosin core solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care, due to the fact that the magnet and pole pieces are one unit and the magnetic circuit remains closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. This should be done by first removing the pickup cover and then placing the pickup assembly on the poles of

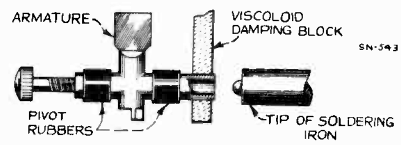


Figure 10—Special Soldering-Iron Tip

a standard pickup magnetizer such as the RCA Pickup Magnetizer, Stock No. 9549, and charging the pickup in accordance with the instructions accompanying the magnetizer. It is recommended that the pickup be magnetized with the armature in place. This will require that one pole piece on the pickup magnetizer be rotated 180 degrees. This gives the desired clearance for the armature clamp assembly. It is preferable to check the polarity of the pickup magnet and to remagnetize it so that the same polarity is maintained.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43
11625	Cable—Radiotron tuning tube cable complete with socket	1.26
11759	Cable—Phonograph input cable complete with 4-contact female connector stock 4153—connects chassis to cable stock 11948	.92
11350	Cap—Contact cap—Package of 5	.20
11465	Capacitor—Adjustable capacitor—(C18)	.48
11289	Capacitor—50 MMfd.—(C37)	.26
5116	Capacitor—175 MMfd.—(C31)	.18
11290	Capacitor—400 MMfd.—(C2, C7, C13, C38)	.25
11401	Capacitor—4000 MMfd.—(C3)	.38
4868	Capacitor—.005 Mfd.—(C29, C34)	.20
4906	Capacitor—.017 Mfd.—(C33)	.25
11395	Capacitor—.01 Mfd.—(C28)	.18
4858	Capacitor—.01 Mfd.—(C32)	.25
4886	Capacitor—.05 Mfd.—(C51)	.20
4839	Capacitor—0.1 Mfd.—(C14)	.28
4841	Capacitor—0.1 Mfd.—(C21)	.22
11414	Capacitor—0.1 Mfd.—(C42)	.20
5170	Capacitor—0.25 Mfd.—(C8)	.25
11240	Capacitor—10 Mfd.—(C36)	1.08
11387	Capacitor—10 Mfd.—(C22)	.86
5212	Capacitor—18 Mfd.—(C35)	1.16
5238	Clip—Antenna terminal board with clip, insulating strip and rivets	.14
11600	Coil—Antenna coil—(L2, L3, L4, L5, C4, R1)	1.78
11601	Coil—Detector coil—(L6, L7, L8, L9, C9, R3)	1.78
11602	Coil—Oscillator coil—(L10, L11, L12, L13, L14, L15, C15, C16	2.15
11385	Condenser—Three-gang variable tuning condenser—(C5, C6, C11, C12, C19, C20)	5.02
4153	Connector—4-contact female connector for cable stock 11759	.48
11892	Dial—Station selector dial scale	.78
11613	**Drive—Variable tuning condenser drive**	**1.00**
11394	Foot—Chassis foot assembly—Package of 2	.70
11893	Indicator—Station selector indicator pointer	.28
5226	Lamp—Dial lamp—Package of 5	.70
11393	Resistor—Voltage divider resistor—comprising one 3,500 ohm and one 13,000 ohm sections—(R15, R20)	.74
11329	Resistor—Voltage divider resistor—comprising one 148 ohm, one 32 ohm and one 85 ohm sections—(R16, R17, R18)	.52
11369	Resistor—12 ohms—Flexible type complete with contact cap—(R22)	.22
11324	Resistor—560 ohms—Carbon type—1/4 watt—(R24)—Package of 5	1.00
8073	Resistor—33,000 ohms—Carbon type—1/2 watt—(R5)—Package of 5	1.00
11322	Resistor—39,000 ohms—Carbon type—1/4 watt—(R10)—Package of 5	1.00
11365	Resistor—82,000 ohms—Carbon type—1/4 watt—(R23)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—1/4 watt—(R19)—Package of 5	1.00

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
11323	Resistor—270,000 ohms—Carbon type—¼ watt—(R13)—Package of 5	1.00
11172	Resistor—470,000 ohms—Carbon type—¼ watt—(R14)—Package of 5	1.00
11397	Resistor—560,000 ohms—Carbon type—1/10 watt—(R2, R4)—Package of 5	.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R9, R31, R32)—Package of 5	1.00
11603	Shield—Antenna or detector coil shield	.26
11604	Shield—Oscillator coil shield	.24
11390	Shield — Intermediate frequency transformer shield	.25
11199	Socket—Dial lamp socket	.14
11195	Socket—5-contact rectifier Radiotron socket	.15
11198	Socket—7-contact 6K7—6F5—or 6H6 Radiotron socket	.15
11196	Socket—8-contact 6A8 or 6F6 Radiotron socket	.15
11386	Switch—Range switch—(S1)	1.16
11392	Switch—Tone control and power switch assembly—(S2, S3)	1.14
11388	Transformer — First intermediate frequency transformer—(L16, L17, C23, C24)	1.90
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C25, C26, C27, R7, R8)	3.02
11803	Transformer—Power transformer—105-125 volts—50-60 cycles	4.38
11804	Transformer—Power transformer—105-125 volts—25-50 cycles	6.02
11805	Transformer—Power transformer—105-130, 140-160, 195-250, volts—40-60 cycles—(T1)	7.95
11391	Trap—Wave trap—(L1, C1)	1.22
11237	Volume control—(R11)	1.20

MOTOR ASSEMBLIES

Stock No.	Description	List Price
11703	Governor—Governor complete for phonograph motor—Stock No. 11701 or No. 11702	3.05
11701	Motor—Phonograph turntable motor — 110 volts—50 to 60 cycles—(M1)	21.20
11702	Motor—Phonograph turntable motor — 110 volts—25 cycles	33.35

MOTOR BOARD ASSEMBLIES

Stock No.	Description	List Price
4594	Box—Used needle box (cup)	.30
7084	Cover—Turntable cover	.40
11704	Damper—Turntable rubber damper and damper plate	.24
4596	Escutcheon—Speed regulator escutcheon plate	.36
4597	Screw—Motor mounting screw assembly—comprising four screws, four lockwashers, four spacers, and four nuts	.22
11696	Turntable—Complete	2.48
11695	Volume Control—Phonograph volume control—(R27, S5)	1.60

ECCENTRIC AUTOMATIC BRAKE SWITCH ASSEMBLIES

Stock No.	Description	List Price
3994	Cover—Eccentric automatic switch cover and screw	.26
10174	Springs—Automatic brake springs—comprising one each of four springs—Package of 2	.50
6896	Switch—Eccentric automatic brake and switch assembly—less switch cover	2.50
3322	Switch—Eccentric automatic switch only—less cover—(S4)	.75

PICKUP AND ARM ASSEMBLIES

Stock No.	Description	List Price
11944	Arm—Pickup arm complete—less escutcheon and pickup unit	4.50
11724	Armature—Pickup armature	.38
6346	Back—Pickup housing back	.45
11946	Coil—Pickup coil—(L23)	.65
3521	Cover—Pickup back cover	.18
11708	Cover—Pickup front cover	.15
3737	Damper—Pickup damper—Package of 5	.65
3390	Escutcheon—Pickup arm escutcheon	.46
11945	Pickup Unit—Complete	4.80
3389	Rod—Eccentric automatic brake trip rod—Package of 5	.40
3387	Screw Assembly — Pickup mounting screw assembly—comprising one screw, one lockwasher and one nut—Package of 10	.40
11549	Screw—Pickup front cover screw—Package of 10	.42
11547	Screw—Pickup needle holding screw—Package of 10	.42

REPRODUCER ASSEMBLIES

Stock No.	Description	List Price
11232	Board—Terminal board assembly with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil—(L20)	2.00
11233	Coil—Hum neutralizing coil—(L21)	.30
11258	Cone—Reproducer cone—(L22)—Package of 5	3.85
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector plug for reproducer cable	.25
9619	Reproducer—Complete	6.05
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20

MISCELLANEOUS ASSEMBLIES

Stock No.	Description	List Price
12038	Band—Rubber band used with tuning tube—Package of 10	.25
11996	Bracket—Tuning tube mounting bracket and clamp assembly	.22
11947	Cable—Two-conductor shielded cable approx. 35-in. long—connects volume control to input transformer	.85
11948	Cable—Three-conductor shielded cable approx. 24-in. long—complete with male connector stock 6123 and grid cap—connects volume control to chassis cable stock 11759	1.50
6123	Connector—4-contact male connector for cable stock 11948	.30
11276	Escutcheon—Tuning tube escutcheon	.40
11376	Escutcheon—Station selector escutcheon and crystal	.70
11582	Knob—Range switch knob—Package of 5	.50

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price	Stock No.	Description	List Price
11610	Knob—Station selector knob assembly—comprising one small and one large knob—Package of 5	1.00	4982	Spring—Retaining spring for large knob in Stock No. 11610—Package of 10	.26
11347	Knob—Volume control or tone control knob—Package of 5	.75	3391	Spring—Motor board mounting spring assembly—comprising one bolt, one "C" washer, two cup washers, one bottom spring, one lockwasher, and one cap nut	.50
11382	Resistor—1 megohm—Carbon type—1/10 watt—(R33)—Package of 5	.75	11949	Transformer—Phonograph input transformer—(T3, R26, R33, C40, C41, C52)	7.05
11210	Screw—Chassis mounting screw assembly—Package of 4	.28			
11381	Socket—Tuning tube socket and cover	.45			
11349	Spring—Retaining spring for knobs, Stock No. 11347, No. 11582 and small knob in Stock No. 11610—Package of 5	.15			

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) It is essential to maintain proper lubrication of phonograph motor to prevent irregular speed.

RCA VICTOR MODEL D22-1A

AND SUPPLEMENTS TO

RCA VICTOR MODELS T6-1, C6-2, D9-19, D11-2, and T11-8

TECHNICAL INFORMATION AND SERVICE DATA

Models T6-1 and C6-2 (with metal rectifier)

Service Data for Models T6-1 and C6-2 are directly applicable to these instruments except as follows:

(1) The schematic and wiring diagrams for metal rectifier socket are shown by figures 1 and 2.

(2) Washer Stock No. 11886 should be used for replacement instead of Stock No. 11230 in all Models T6-1 and C6-2. See parts list herein for description and price.

(3) Refer to Substitute and Additional Replacement Parts contained herein for other parts changes.

Model D9-19 (with low-frequency tone control and metal Rectifier)

Service Data for Model D9-19 are directly applicable to these instruments except as follows:

(1) The schematic and wiring diagrams for Model D9-19 (with low-frequency tone control and metal rectifier) are shown by figures 6 and 7.

(2) Washer Stock No. 11886 should be used for replacement instead of Stock No. 11230 in all Models D9-19. See parts list herein for description and price.

(3) Bracket Stock No. 13615 should be used for replacement instead of Stock Nos. 11191 and 11192 in all Models D9-19. See parts list herein for description and price.

(4) Refer to Substitute and Additional Replacements Parts contained herein for other parts changes.

Model D11-2 (with metal rectifier and capacitor phonograph motor)

Service Data for Model D11-2 are directly applicable to these instruments except as follows:

(1) The schematic and wiring diagrams for metal rectifier socket are shown by figures 1 and 2.

(2) The phonograph motor is of the capacitor type. Light machine oil should be used to lubricate the motor bearings. The motor is wired in this instrument as follows: One power-supply lead connects to one terminal of switch S-14. The other terminal of S-14 connects to one terminal of the brake switch S-15. The other terminal of S-15 connects to the yellow motor lead. The green motor lead connects to one lead of the motor capacitor. The red motor lead connects to the other capacitor lead and also to the remaining power-supply lead.

(3) Change description of Stock No. 8053 to read: Indicator—Station selector vernier indicator pointer—$0.12.

(4) Stock No. 11793 applies to all Models D11-2. See parts list herein for description and price.

(5) Change price of Stock No. 11541 Arm—Eject arm from $0.82 to $8.15.

(6) Change description of Stock No. 9620 to read: Reproducer, complete (without cloth screen) $16.32.

(7) Refer to Substitute and Additional Replacement Parts contained herein for other parts changes.

Model T11-8 (with metal rectifier)

Service Data for Model T11-8 are directly applicable to these instruments except as follows:

(1) The schematic and wiring diagrams for metal rectifier socket are shown by figures 1 and 2.

(2) Refer to Substitute and Additional Replacement Parts contained herein for other parts changes.

Model D22-1A

Service Data for Model D22-1 are directly applicable to these instruments except as follows:

(1) The schematic circuit diagram for Model D22-1A is shown by figure 5.

(2) The metal rectifier socket wiring for tube No. 14 is shown by figure 2.

(3) Figure 3 shows the Pickup details.

(4) The phonograph motor is of the capacitor type. Light machine oil should be used to lubricate the motor bearings. The motor is wired in this instrument as follows: One power-supply lead connects to one terminal of switch S201. The other terminal of S201 connects to one terminal of the brake switch S202. The other terminal of S202 connects to the yellow motor lead. The green motor lead connects to one lead of the motor capacitor. The red motor lead connects to the other capacitor lead and also to the remaining power-supply lead.

(5) The Radiotron socket voltages (figure 4 herein) apply to all Models D22-1 or D22-1A and should be used in place of figure 4 of the D22-1 Service Data.

(6) The resistor assembly R44 and R45 is mounted on the front chassis apron instead of the rear chassis apron.

(7) Change price on Stock No. 11879 Transformer from $3.50 to $8.15.

(8) Change price on Stock No. 11541 Arm from $0.82 to $8.15.

(9) Change price on Stock No. 11480 Microphone from $7.05 to $7.50.

(10) Refer to Substitute and Additional Replacement Parts contained herein for other parts changes.

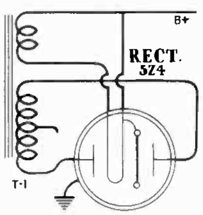


Figure 1

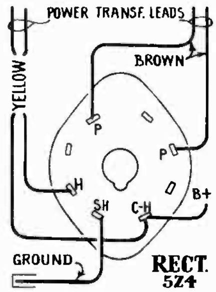


Figure 2

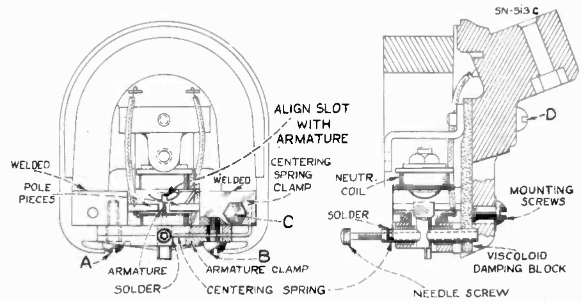


Figure 3—Pickup Details (D-22-1A)

Substitute and Additional Replacement Parts

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

Stock No.	Description	List Price
	Models T6-1 and C6-2 (with metal rectifier)	
8072	Resistor—33,000 ohms—Carbon type—½ watt—(R4)—Package of 5	$1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—(R3)—Package of 5	1.00
11848	Transformer — Power transformer — 105-125 volts—50-60 cycles—(T1)	4.40
11849	Transformer—Power transformer—105-125 volts—25-50 cycles	5.70
11850	Transformer—Power transformer—100-130/140-160/195-250 volts—40-60 cycles	8.00
11886	Washer—Spring washer—Used to hold field coil securely—Package of 5	.20
	Stock Nos. 4841 (C23), 11283, 3066, 5029, 5158, 11383, 11458, 11585, and 11584 are not used in chassis having metal rectifier.	
	Model D9-19 (with metal rectifier)	
5170	Capacitor—0.25 mfd. (C51)	.25
11329	Resistor—Voltage divider resistor, comprising one 148-ohm, one 32-ohm, and one 85-ohm section (R15, R16, R17)	.52
5033	Resistor—33,000 ohms—Carbon type—1 watt—(R51)—Package of 5	1.10
5029	Resistor—56,000 ohms—Carbon type—¼ watt—(R68)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—(R50)—Package of 5	1.00
11195	Socket—Five-contact rectifier Radiotron socket	.15
5224	Switch—Low-frequency tone control and power switch (S12, S15)	1.00
11804	Transformer—Power transformer—105-125 volts—25-60 cycles	6.02
11805	Transformer—Power transformer—100-130/140-160/195-250 volts—40-60 cycles—(T1)	7.95
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20
13615	Bracket—Tuning tube mounting bracket and clamp assembly	.25
	Stock Nos. 4858 (C50*), 11248, 4748, 11245, 11273, 4794, 11133, 11242, 11243, 11230, 11191, and 11192 are not used in chassis having metal rectifier.	
	Model D11-2 (with metal rectifier)	
11195	Socket—Five-contact rectifier Radiotron socket	.15
11793	Indicator—Station selector indicator pointer	.15
12051	Capacitor—2-mfd. motor capacitor, complete with cable and 2-contact male connector	4.18
9650	Motor—105-125 volts—60 cycles (M1)	35.35
9651	Motor—105-125 volts—50 cycles (M1)	35.35
12037	Filter—Filter pack for phonograph (used in some models)	1.72
9652	Reproducer complete (with cloth screen)	16.32
12050	Suspension spring—Motor mounting spring, washer, and stud assembly—comprising six springs, six cup washers, three spring washers and three studs	.60
	Stock Nos. 4858, 11273, 4794, 9012, 9014, 9011 and 4562 are not used in chassis having metal rectifier.	
	Model T11-8 (with metal rectifier)	
11195	Socket—Five-contact rectifier Radiotron socket	.15
	Stock No. 4794 is not used in chassis having metal rectifier.	
	Model D22-1A (use replacement parts from D22-1 except as listed below)	
13405	Armature—Pickup armature	.95
4870	Capacitor—.025 mfd. (C47)	.20
11195	Socket—Five-contact Rectifier Radiotron socket for tube No. 14	.15
11887	Transformer—Power transformer—105-125 volts—25-50 cycles	6.95
11880	Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)	5.80
12051	Capacitor—2-mfd. complete with 2-contact male connector for use with motor Stock Nos. 9650 or 9651—(C217)	4.18
13101	Capacitor—4-mfd. complete with 2-contact male connector for use with motor Stock No. 9735—(C217)	5.05
4674	Connector—2-contact male connector for capacitor Stock No. 12051 or 13101	.25
9735	Motor—105-125 volts—25 cycles—(M1)	49.50
9651	Motor—105-125 volts—50 cycles—(M1)	35.35
9650	Motor—105-125 volts—60 cycles—(M1)	35.35
12050	Suspension Spring—Motor mounting spring, washer, and stud assembly—comprising six springs, six cup washers, three spring washers and three studs	.60
11997	Capacitor—75 mmfd.—(C216)	.14
12352	Filter—Microphone and pickup input filter pack—(L307, C218, R223)	1.85
	Stock Nos. 4858 (C47), 11273, 4794 (tube 14), 8062, 8061, 9479, 9478, 9477, and 4562, are not used in Model D22-1A.	

The prices quoted above are subject to change without notice.

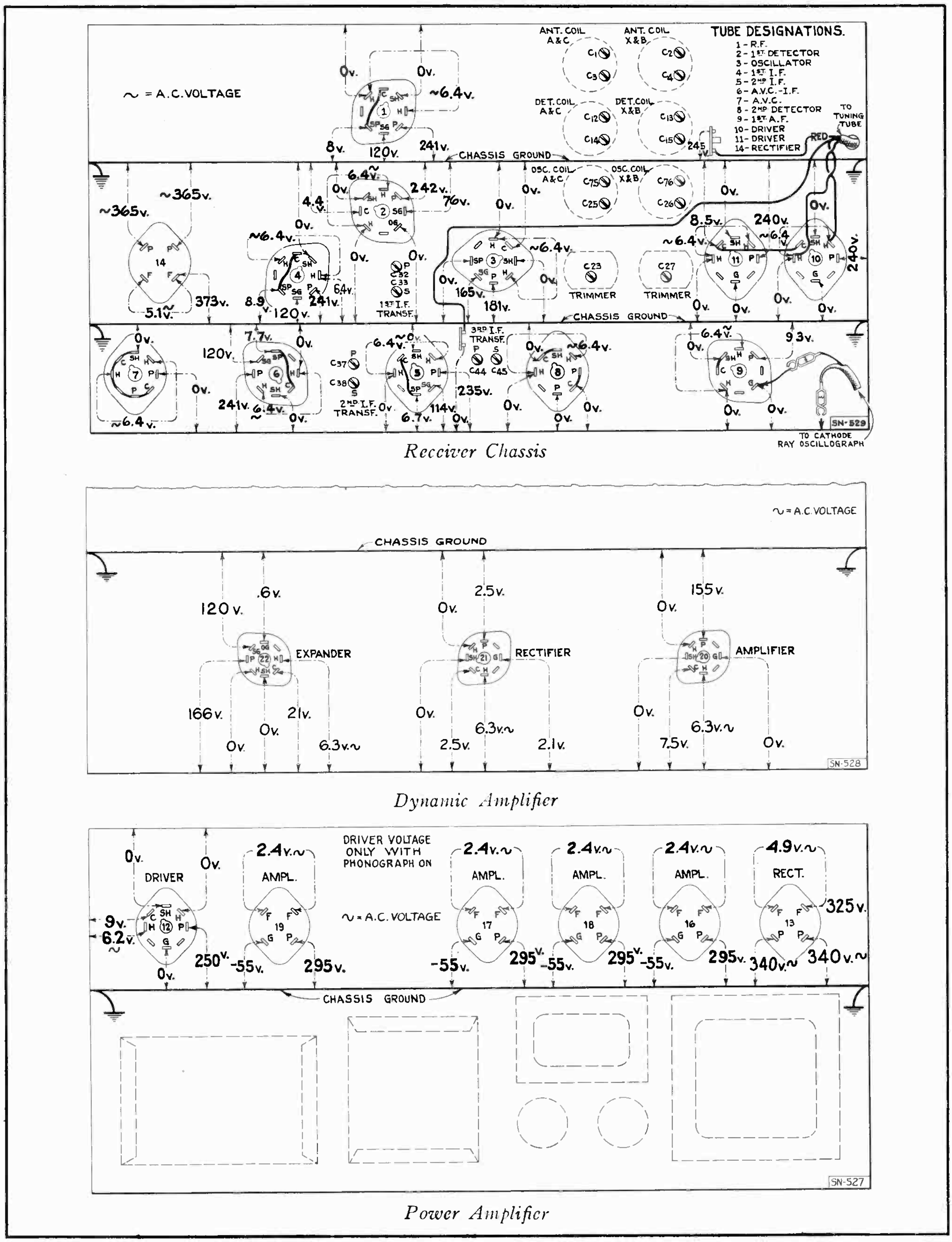
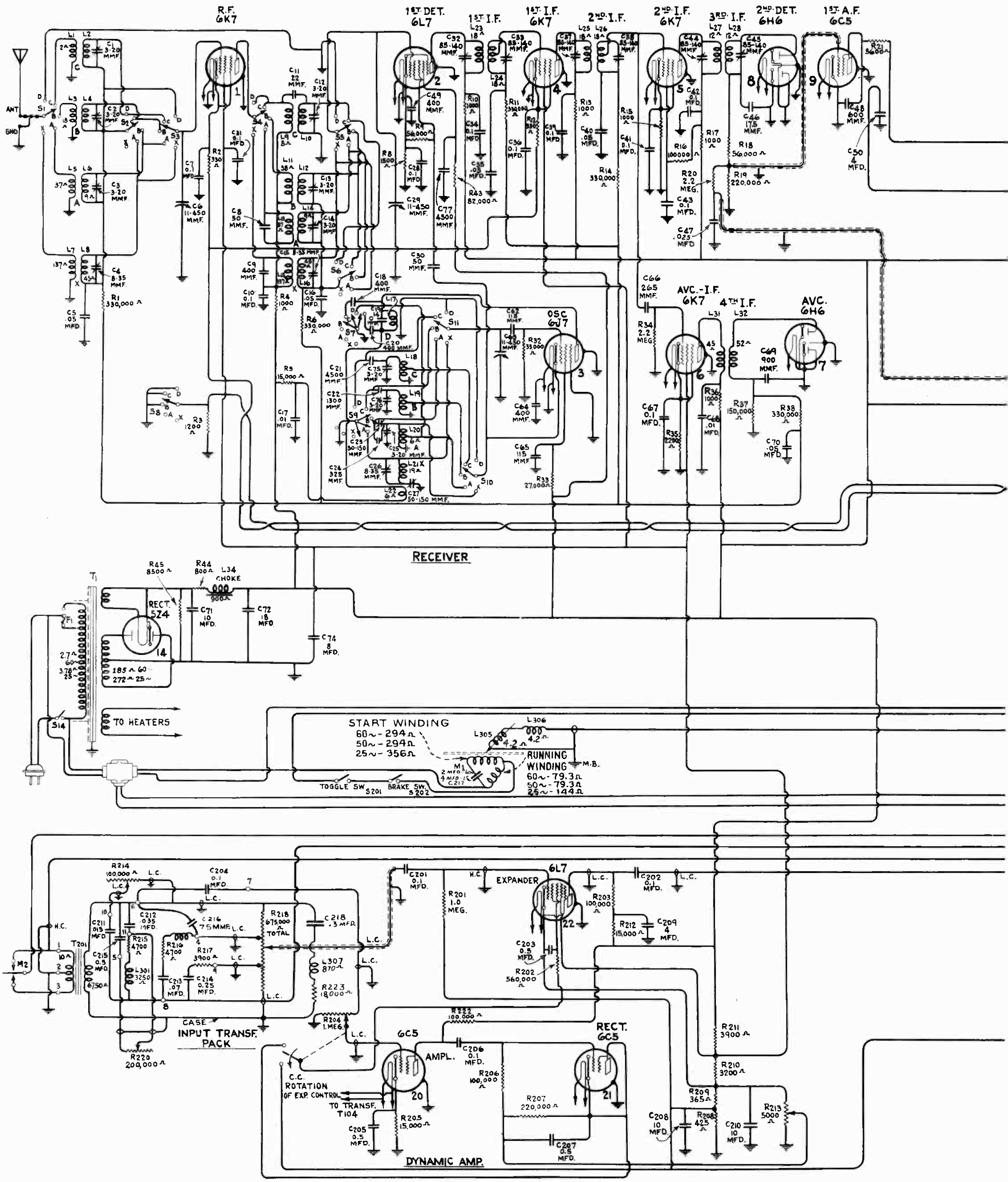


Figure 4—Radiotron Socket Voltages (D22-1 and D22-1A)
Measured at 115 volts, 60-cycle supply—No signal being received


R.F. 6K7
1ST DET. 6L7
1ST I.F.
1ST I.F. 6K7
2ND I.F.
2ND I.F. 6K7
3RD I.F.
2ND DET. 6H6
1ST A.F. 6C5
ANT
GND
OSC 6J7
AVC.-I.F. 6K7
4TH I.F.
AVC. 6H6
RECEIVER
RECT 5Z4
L34 CHOKE
TO HEATERS
START WINDING
60~-294Ω
50~-294Ω
25~-356Ω
RUNNING WINDING
60~-79.3Ω
50~-79.3Ω
25~-144Ω
M.B.
TOGGLE SW S201
BRAKE SW S202
EXPANDER 6L7
CASE
INPUT TRANSF. PACK
6C5 AMPL.
RECT. 6C5
C.C. ROTATION OF EXP. CONTROL
TO TRANSF. T104
DYNAMIC AMP.

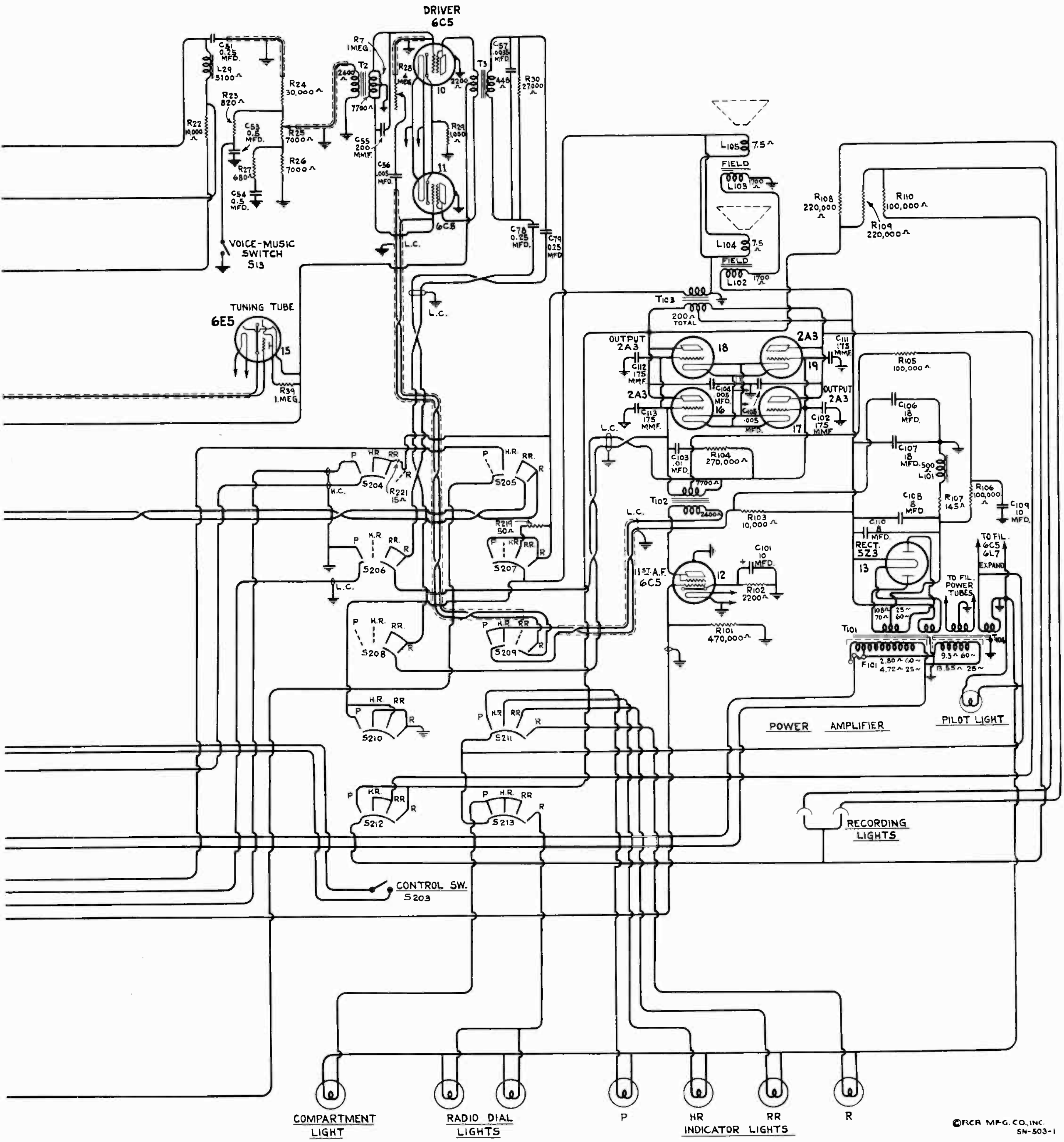


Figure 5—Schematic Circuit Diagram
(Model D22-1A)

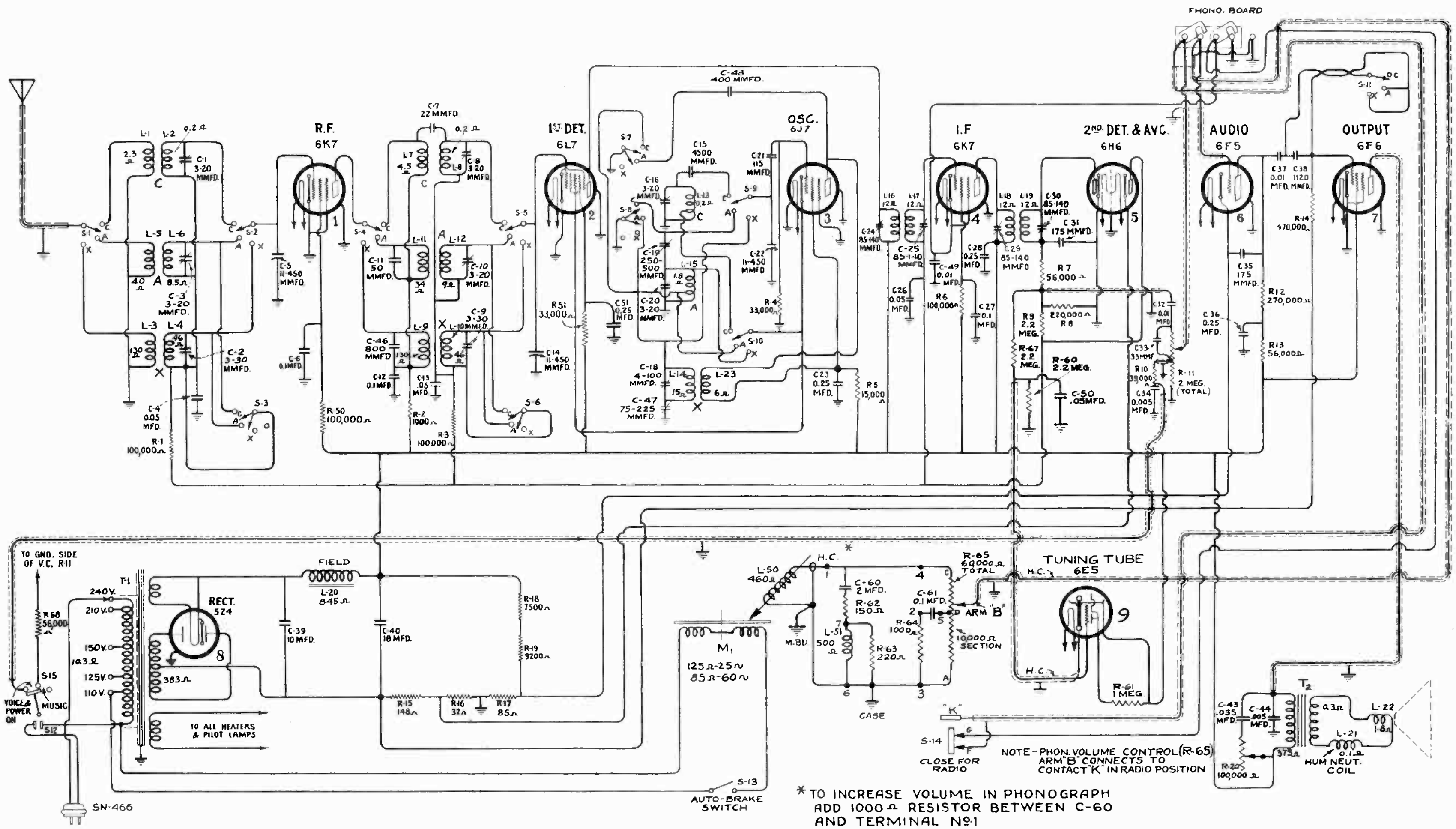


Figure 6—Schematic Circuit Diagram
(Model D9-19 with metal rectifier and low-frequency tone control)

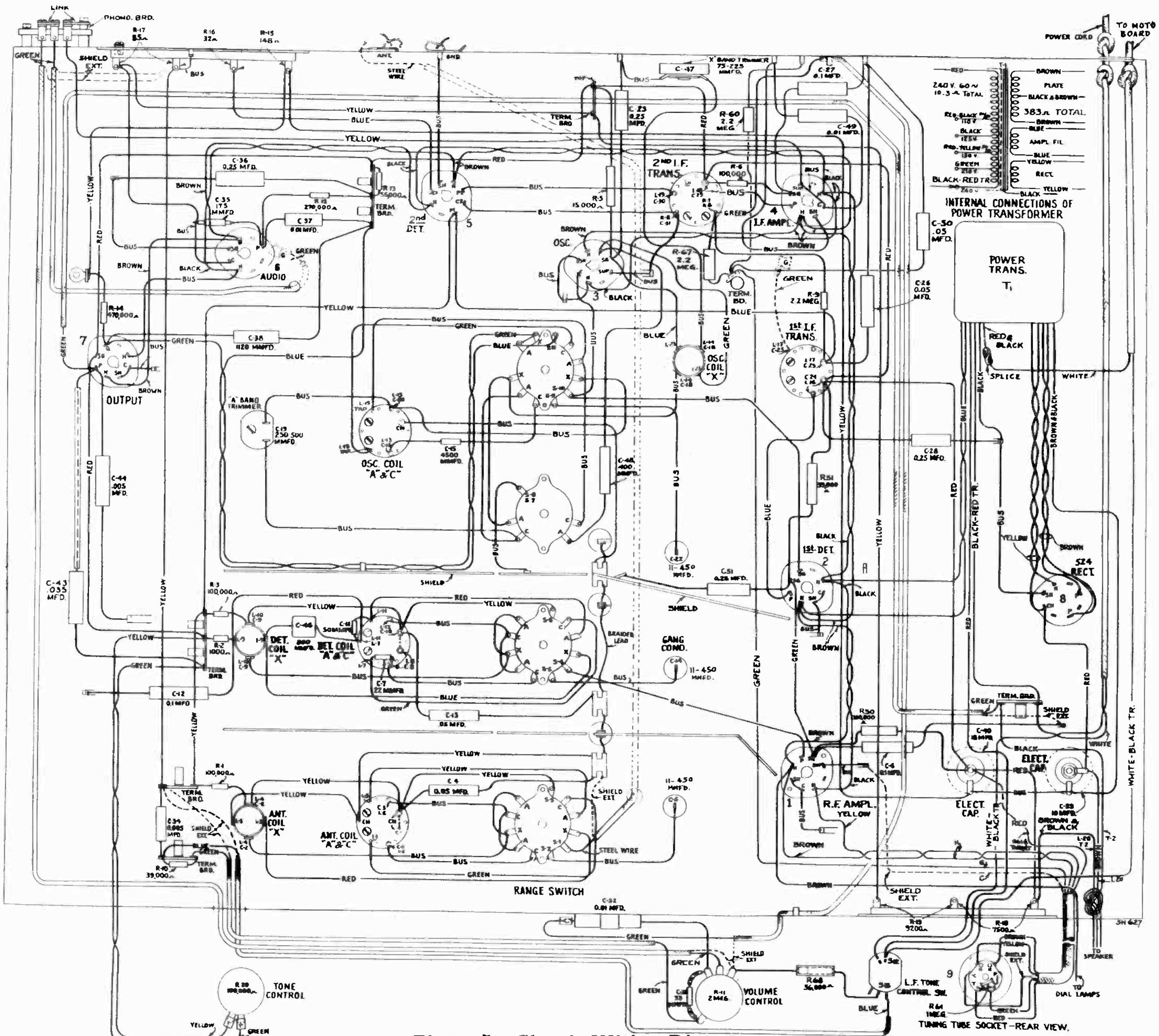


Figure 7—Chassis Wiring Diagram
(Model D9-19 with metal rectifier and low-frequency tone control)

RCA VICTOR PORTABLE VICTROLA
MODEL 0-1

SERVICE DATA

Motor.—The drive motor is of simple design and substantial construction. It should require little or no service if properly maintained. Attention to lubrication of the moving parts and occasional cleaning of the mechanism will go far to prevent faulty operation. Should it become necessary to repair the motor, the following procedure should be applied: **CAUTION.—Allow the motor mechanism to run down completely before attempting adjustment, repairs, or replacements.**

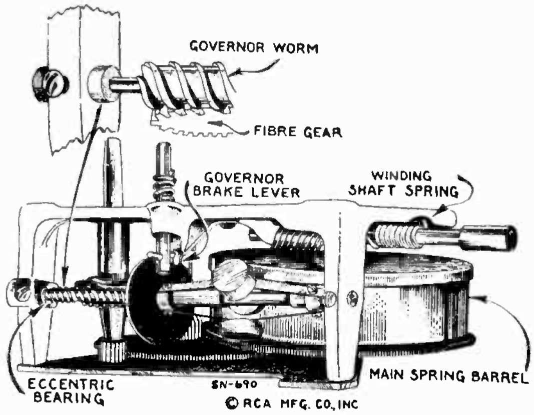
Removing Motor from Cabinet.—Remove the winding key. To dismount the motor, unscrew the spindle cap with a screwdriver and remove turntable, slightly tapping the spindle while exerting an upward lift on the turntable. Remove the five screws holding the motor board and the two screws holding lid support to cabinet and lift motor board assembly from case. Loosen the screw holding the speed-regulating lever and remove the latter. The three screws holding motor to motor board should then be loosened to permit removal of motor assembly.

Replacing Main Spring Barrel.—In case of main spring failure, the entire spring barrel and gear should be replaced. Remove the spring-barrel spindle screw by **unscrewing to right.** Remove the C washer and two pillar screws holding bottom plate. Remove bottom plate, intermediate spindle shaft, and spring barrel. Reassemble parts in reverse sequence.

Winding Shaft Spring.—This spring functions as a friction ratchet. It may be removed as follows: remove pin holding winding worm on shaft; remove winding shaft; then remove screw holding spring. Replace in reverse sequence.

Governor Adjustments.—The mesh of the worm and fiber gears is adjusted by rotation of the eccentric spindle bearings. The adjustments should be made so that the worm meshes properly with the fiber gear and rotates freely without binding. The bearings should be accurately aligned with each other. The minimum of spindle end-play which permits smooth operation should be used.

Speed Regulator Lever.—After assembly, adjust the speed regulator until the turntable rotates at 78 r. p. m.; loosen the speed regulator screw and set pointer to center of speed indicator scale; tighten screw and recheck turntable speed.



Lubrication.—All moving parts of the motor should be thoroughly cleaned and lubricated every six months to prevent excess wear and to assure proper operation. A small amount of grease should be applied to the worm gear of the governor, the gear of the winding shaft, and on the small pinion gear. All other points, including regulator friction pad, should be lubricated with light oil. All motor parts should be covered with a light film of oil to prevent rusting.

REPLACEMENT PARTS

Stock No.	Description	List Price	Stock No.	Description	List Price
13849	Arm—Tone arm less sound box	$3.75	13874	Horn—Tone arm horn	*
13877	Board—Motor mounting board only (black)	*	13846	Indicator—Speed regulator arm and pointer	.35
13878	Board—Motor mounting board only (brown)	*	13861	Key—Winding key	.50
13850	Brake—Turntable brake complete	.50	13854	Motor—Spring motor complete	10.00
13845	Cap—Turntable spindle cap	.30	13865	Screw—Needle holding screw—Pkg. of 5	.25
13875	Case—Carrying case only (black)	*	13860	Shaft—Winding key shaft and socket—Less winding gear	.55
13876	Case—Carrying case only (brown)	*	13848	Sound box	2.25
13853	Cover—Needle cup hinged cover	.35	13856	Spindle—Motor spindle and two gears assembled	1.50
13852	Cup—Needle cup	.20	13851	Spring—Turntable brake spring—Pkg. of 5	.30
13847	Escutcheon—Speed regulator escutcheon	.30	13835	Spring—Mainspring, spring barrel and drive gear	2.50
13855	Gear—Intermediate drive gear and shaft	.95	13873	Turntable—Complete with black cover	3.00
13858	Gear—Winding worm gear—Located on winding key shaft	.50	13844	Turntable—Complete with brown cover	3.00
13859	Gear—Winding gear—Located on spring barrel shaft	.50	14181	Turntable—Complete with blue cover	3.00
13857	Governor—Governor assembly complete	3.65	13862	Weight—Governor weight and spring—Pkg. of 3	.90

* Prices upon application.

Prices quoted above are subject to change without notice.

SERVICE DIVISION

RCA Manufacturing Co., Inc.

CAMDEN, N. J., U. S. A.

RCA VICTOR MODEL R-99

High-Fidelity Electrola

TECHNICAL INFORMATION

Electrical Specifications

Radiotron Complement
(1) RCA-6L7............Audio Volume Expander
(2) RCA-6C5....................Audio Driver
(3) RCA-2A3....................Power Output
(4) RCA-2A3....................Power Output
(5) RCA-6C5................Expander Amplifier
(6) RCA-6H6................Expander Rectifier
(7) RCA-5Z3................Full-Wave Rectifier

Audio Frequency Range..Approximately 30 to 8,000 cycles

Power Output
Undistorted............................12 watts
Maximum.............................15 watts

Pickup
Type...................Low Impedance Magnetic
Impedance...............100 ohms at 1,000 cycles

Loudspeaker
Type...............Super 12-inch Electrodynamic
Impedance (V.C.)........11¼ ohms at 400 cycles

Phonograph (Manual Operated)
Motor.......................Synchronous Type
Speed (at rated frequency)..............78 r.p.m.

Power-Supply Ratings
Voltage..105-125 volts
Frequency (two types)..50 or 60 cycles
Power Consumption..180 watts

Mechanical Specifications

Height..34 inches
Width..25⅛ inches
Depth..14⅞ inches
Weight (net)..112 pounds
Weight (shipping)...156 pounds
Amplifier Base Dimensions..................16¼ inches x 7½ inches x 2¾ inches
Over-all Amplifier Height.....................................7⅝ inches
Operating Controls.........................(1) Power Switch—Tone, (2) Dynamic Expander, (3) Volume

General Description

The RCA Victor Model R-99 High-Fidelity Electrola comprises the ultimate in present-day record reproduction. It consists of the revolutionary dynamic expander; a high-quality, high-power output, power amplifier; a 12-inch, aluminum voice-coil, electrodynamic loudspeaker with a high-frequency tone diffuser; a light weight, high-fidelity pickup; an acoustically tapered volume control; a spring-balanced tone arm; a powerful synchronous motor; and a high audio-frequency tone control. The instrument will play either 10- or 12-inch records.

Dynamic Amplifier

Limitations imposed by present methods of disc recording necessitate a constricted range of sound intensity which may be recorded. The minimum intensity of sound which may be recorded is determined by unavoidable record surface-noise which masks the recorded sound when such sound approaches the intensity of the noise. The maximum sound intensity which may be recorded is determined by the thickness of the record groove-wall into which the record-cutting stylus makes an impression of the original sound. The amplitude of the lateral cutting is, therefore, regulated so that the stylus will not break over into the adjacent groove. It is because of these upper and lower limits that the volume range of sound reproduction cannot be identical to the original sound which is produced in the recording studio. In order to keep the recorded sound within the limits of the record, the recording control engineer regulates the recording amplifiers accordingly.

The dynamic amplifier of this reproducing instrument is designed to compensate for the above-mentioned recording limitations of volume range. It serves to restore the original intensity relations of the recorded sound by varying the amplification of the reproducing amplifier in direct accordance with the average intensity value of the sound. Thus, when there is a prevailing rise in the intensity of the recorded sound, the dynamic amplifier increases in gain accordingly, producing a further increase in volume, and conversely when there is a prevailing tendency toward a decrease of the recorded sound, the dynamic ampli-

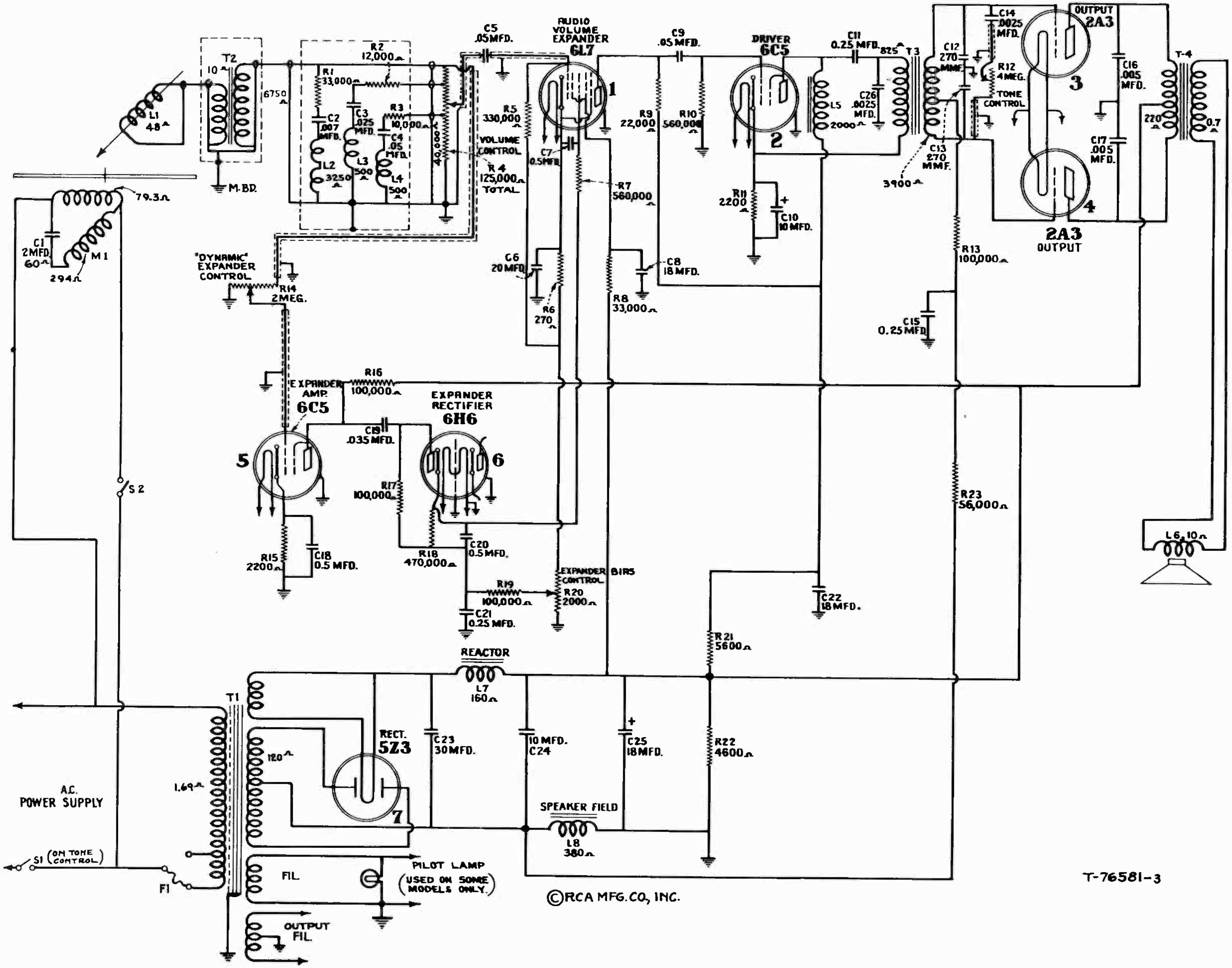


Figure 1—Schematic Circuit Diagram

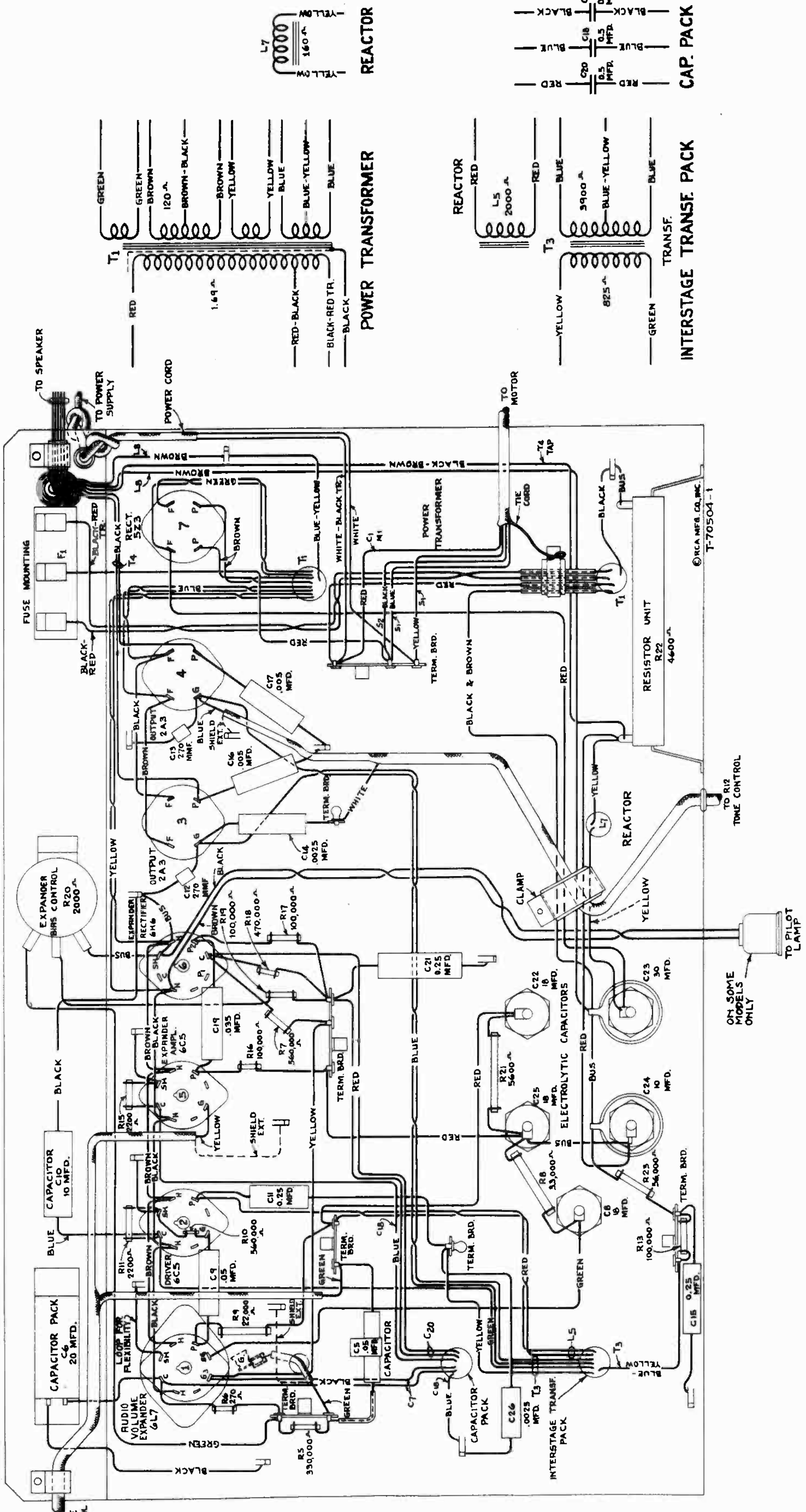


Figure 2—Chassis Wiring Diagram

fier decreases in gain, and produces a further decrease in volume. The functions of the dynamic amplifier are particularly advantageous in the reproduction of symphonic and certain other types of music where very great ranges of sound intensity are encountered. The dynamic amplifier causes the very loud or fortissimo, and the very soft or pianissimo passages to be reproduced in their natural relations, although they may have been somewhat modified in the actual recording on the record.

Power Amplifier

In order that the dynamic amplifier may bring about its designed purpose, the amplifier and reproducing system into which it works must have an undistorted range of amplification consistent with the degree of volume expansion provided in the dynamic amplifier. The power amplifier is, therefore, designed to have a maximum output of 15 watts.

Loudspeaker

The 12-inch dust-proof electrodynamic loudspeaker provided with this unit is of massive design. It is constructed with an aluminum voice coil, which permits the weight of the moving unit to be greatly reduced, with consequent increase of the frequency range. A high-frequency tone diffuser is provided in front of the cone of the loudspeaker unit to disperse the higher frequency sound waves over a wide acoustic angle instead of being emitted in a concentrated beam directly in front of the unit.

Pickup

The magnetic pickup and tone arm assembly is of an improved design. It is constructed with a short and very light armature for the most delicate response. The tone arm is spring-balanced, allowing the effective weight of the pickup on the record to be materially reduced.

Electrical Circuits

The circuits consist of a phonograph pickup with compensating filters, dynamic expander stage, expander amplifier stage, expander diode-rectifier stage, audio driver stage, push-pull power output stage, and a full-wave rectifier.

The electrical impulses, generated in the pickup coil L1, are boosted in the input transformer T2 before they are fed to the dynamic amplifier. A compensation filter is placed in shunt with the output of T2 to correct the frequency response of the reproducing system so as to compensate for the recording characteristic.

Dynamic Amplifier

The signal from the input transformer T2 is supplied to control grid No. 1 of the RCA-6L7 (expander) through the acoustically tapered volume control R4, and is simultaneously applied through the expander control R14 to the control grid of the first RCA-6C5 (expander amplifier). The signal applied to this latter tube is first amplified and then fed to the RCA-6H6 (expander diode-rectifier) tube where it is rectified. The output of the RCA-6H6 is of the nature of a pulsating direct current, the amount varying in direct relation with the average value of intensity of the audio signal. This pulsating voltage appears across resistor R18 and is applied to the second control grid of the RCA-6L7 (expander) through a delay filter (R7 and C7). The value of the bias on this control grid determines the amplification of the RCA-6L7 expander stage. The gain of the dynamic amplifier is, therefore, automatically regulated by the average intensity of the audio signal.

Audio Driver

The audio output of the RCA-6L7 is resistance-capacitance coupled to the control grid of RCA-6C5 audio driver. The output of this tube is shunt fed to the primary of the interstage transformer T3 by means of the reactance L5 and blocking capacitor C11. This arrangement prevents the plate current of the RCA-6C5 from flowing through the primary of T3, permitting increased fidelity.

Power Amplifier

The audio signal developed across the secondary of T3 is applied to the control grids (push-pull) of the RCA-2A3 tubes for final power amplification. The bias for these control grids is developed across

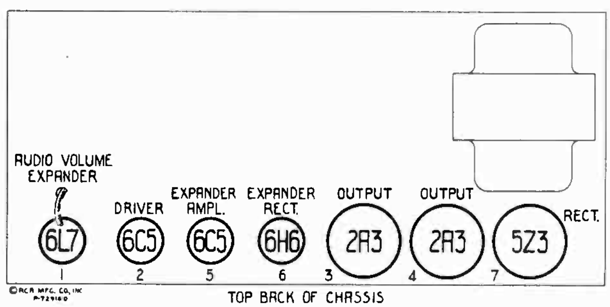


Figure 3—Radiotron Locations

the loudspeaker field winding L8 and is applied through a suitable resistance-capacitance filter. The output of the power-amplifier stage is transformer-coupled to the voice coil of the electrodynamic loudspeaker.

Power Supply

The power-supply system consists of an RCA-5Z3 rectifier tube, which is supplied from an efficiently designed power transformer, and which works into a suitable filter. The potentials required for the plate, screen, control grid, and cathode circuits are obtained from this filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

SERVICE DATA

The various diagrams in the booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1, etc., are provided for reference between the illustrations, and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Dynamic Amplifier Adjustments

It is essential that correct voltages and currents exist at the RCA-6L7 audio expander stage in order that the expanding function may take place in the proper manner. A screw-driver adjustment is accordingly provided to regulate the RCA-6L7 control grid No. 2 bias to the correct operating value. Two methods of adjustment are applicable. Either method requires a normal voltage of 300 volts across the filter output (resistor R22, see figure 7). The one to be preferred (a) requires the use of the **RCA Stock No. 9633 Beat Frequency Oscillator** or the equivalent, a 100-ohm resistor, a 200-ohm resistor, and a 1,000-ohm-per-volt a-c voltmeter (rectifier-type) having a "low" range of 1.0 volt and a "high" range of 250 volts or greater. The less accurate method (b) requires the use of the **RCA Stock No. 12353 Split Plate Adapter** (supplied with instrument), and a suitable d-c milliammeter. Both of these procedures are outlined below. **CAUTION: Before using either method, be sure that power-supply fuse is in proper position for the line voltage.**

(a) **Preferred Method.**

Turn power switch (left front) off. Connect the 200-ohm and the 100-ohm resistors in series between the beat-frequency oscillator terminals (upper "250" and "CT") with the 100-ohm resistor connected to "CT." Calibrate the beat-frequency oscillator, adjust it to 1,000 cycles, and reduce its output. Connect the 1,000-ohm-per-volt a-c voltmeter (1-volt range) to the beat-frequency oscillator terminals (upper "250" and "CT"). Remove the "M" plug from the "F" receptacle on the shielded cable running between the input transformer T2 and the compensator pack "Comp." (see figure 9). Connect beat-frequency oscillator terminal "CT" to the large pin on the "M" plug. Connect the junction of the 200-ohm and the 100-ohm resistors to the small pin on the "M" plug.

Adjust beat-frequency oscillator output until the voltmeter reads exactly 1.0 volt. Remove the voltmeter leads from beat-frequency oscillator terminals without disturbing any of the oscillator adjustments. Place the voltmeter to its 250-volt or greater range and connect it between the plate prongs of the two RCA-2A3 power-output tubes. Connections to the tube prongs may be made by stripping approximately ½ inch of insulation from the ends of two short leads of rubber-covered wire, wrapping one bare end around each plate prong (being careful not to allow the bare ends to short on the chassis when the tubes are placed in their sockets), and connecting the voltmeter to these leads. **CAUTION: Do not touch these plate connections after the power is turned on since the potential at these points is rather high and carelessness might result in a serious shock.**

Set the expander "Dynamic" control (center front) to its extreme counter-clockwise position. Set the phonograph volume control (right front) to its extreme clockwise position. Turn on power switch (left front) and rotate this control to its extreme clockwise position, allowing it to remain in this position for all adjustments. Allow a few minutes for the instrument to become stabilized. Adjust the expander bias control R20, on rear apron of amplifier (see figure 9), until the voltmeter reads 195 volts. Turn phonograph volume control to extreme counter-clockwise position. Transfer lead from the junction of the 200-ohm and the 100-ohm resistors to the beat-frequency oscillator (upper "250") terminal without disturbing any of the oscillator adjustments. Adjust phonograph volume control (right front) until the voltmeter reads 50 volts. Turn the expander "Dynamic" control (center front) to its extreme clockwise position allowing maximum expansion to take place. The voltmeter reading should now read not less than 150 volts if the expander circuit is operating correctly. Failure to do so indicates a defect in the system and the usual service procedure should be followed.

(b) **Alternate Method.**

Turn power switch (left front) off. Place **RCA Stock No. 12353 Split Plate Adapter** under the RCA-6L7. Connect a suitable d-c milliammeter to the adapter. Turn both the phonograph volume control (right front) and the expander "Dynamic" control (center front) to their extreme counter-clockwise positions. Turn on power switch (left front) and allow a few minutes for the instrument to become stabilized. Adjust expander bias control R20, on rear apron of amplifier (see figure 9), to give 1.0 milliampere of plate current with no signal input to the dynamic amplifier.

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

Centering Armature

Refer to figure 4 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed, the

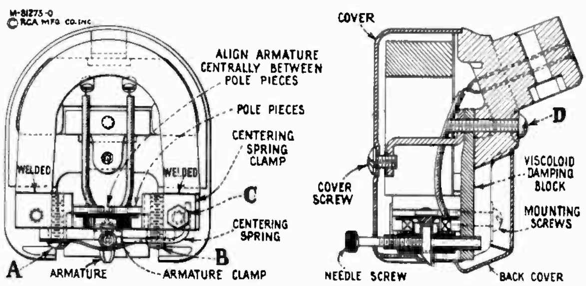


Figure 4— Details of Pickup

screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support

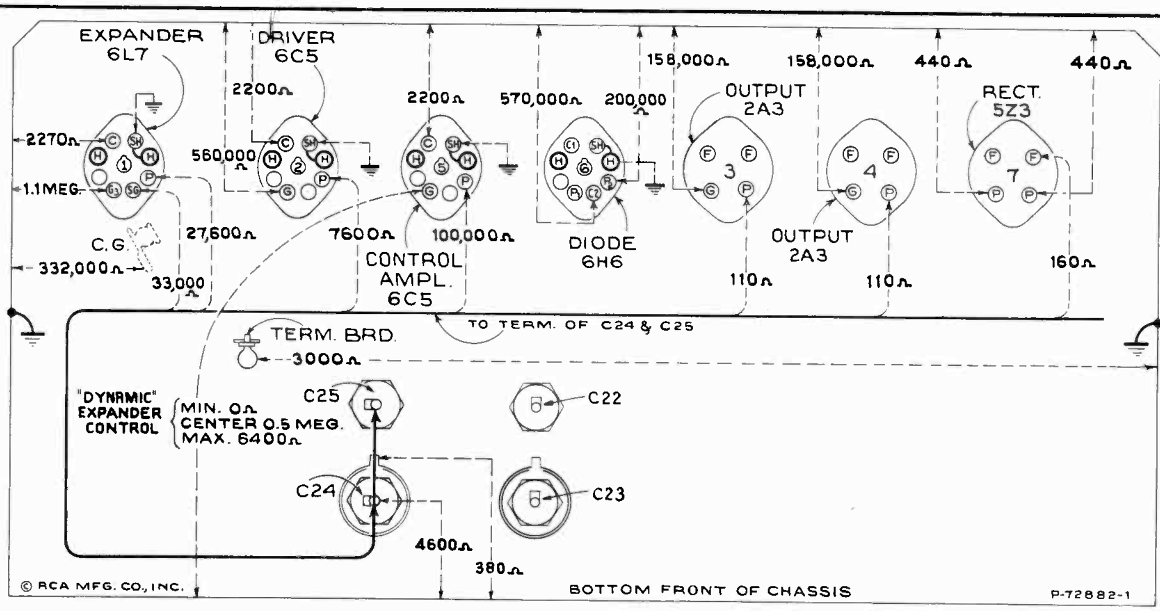


Figure 5—Resistance Diagram

Power supply disconnected—Radiotrons in sockets

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and amplifier chassis ground, on figure 5, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm 20\%$. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly

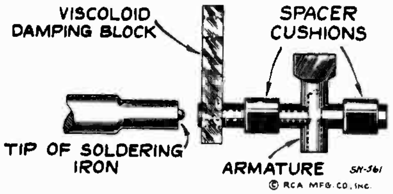


Figure 6—Special Soldering-Iron Tip

cleaned with fine emery cloth. Then insert the new block so that it occupies the same position as it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in figure 6 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to re-adjust the armature as previously explained after re-assembly of the mechanism. Only rosin core solder should be used for soldering the coil leads in

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1) RCA-6L7—Expander	7.6 ma.
(2) RCA-6C5—Audio Driver	4.4 ma.
(3) RCA-2A3—Power Output	41 ma.
(4) RCA-2A3—Power Output	41 ma.
(5) RCA-6C5—Expander Amplifier	1.9 ma.
(6) RCA-6H6—Expander Rectifier	0 ma.
(7) RCA-5Z3—Rectifier	165 ma.*

(* Cannot be measured at socket)

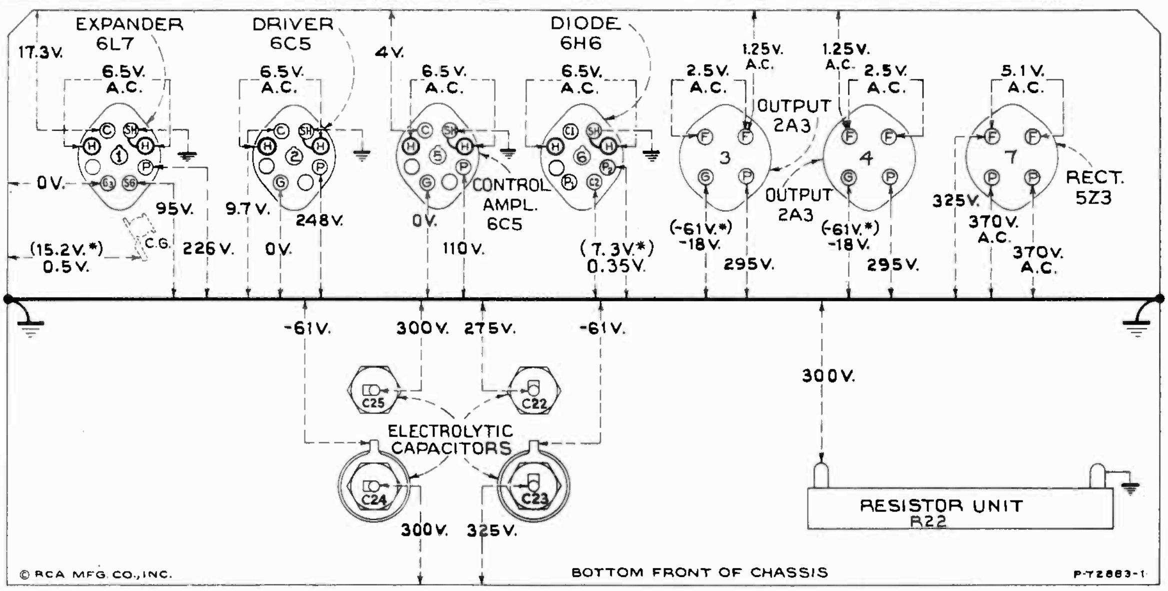


Figure 7—Radiotron Socket Voltages

Measured at 120 volts on 120-volt tap, rated frequency—Volume control minimum—Expander "Dynamic" control minimum—Dynamic amplifier adjusted as per text—No signal

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to amplifier chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within $\pm 20\%$ when the amplifier is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

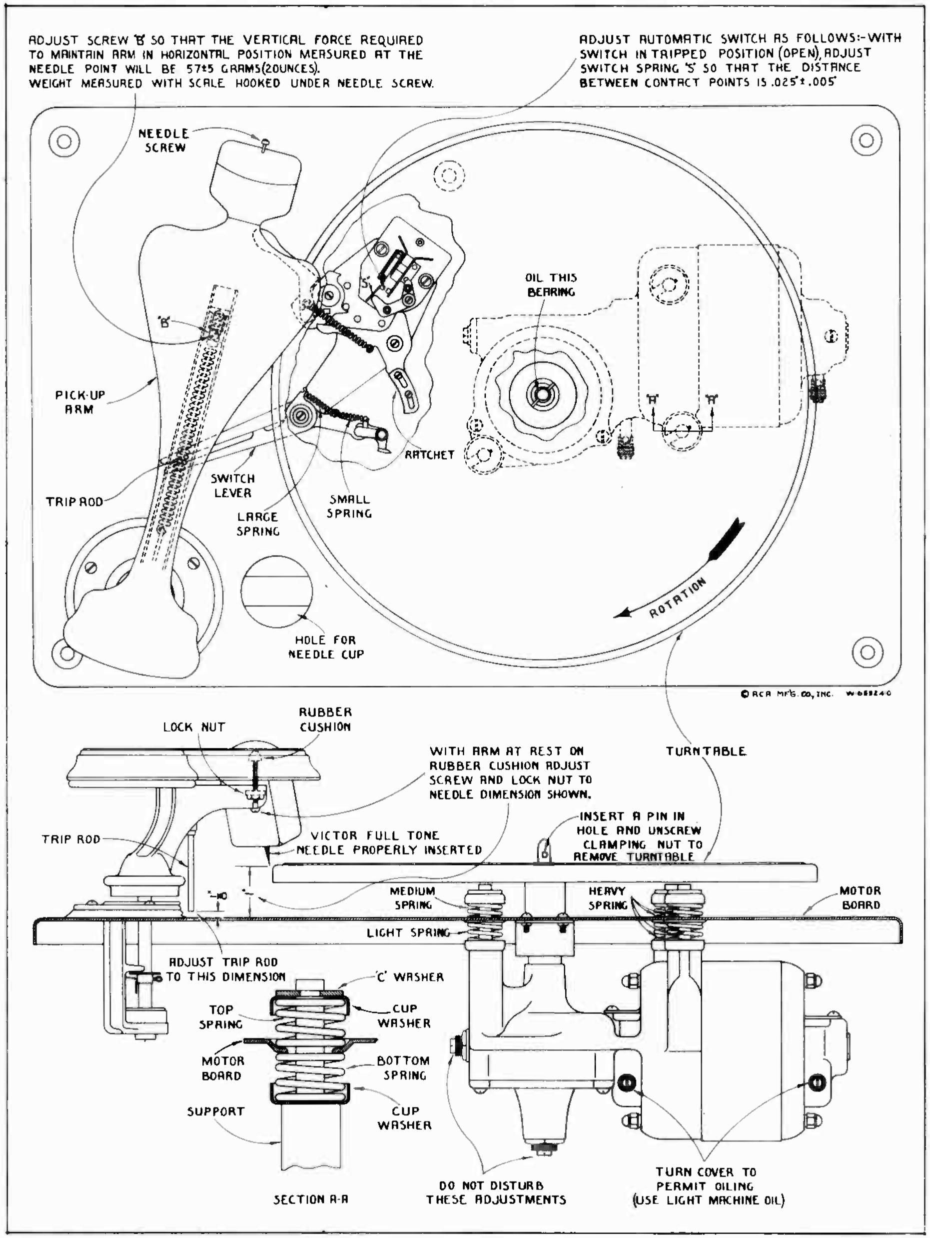


Figure 8—Motor Board Adjustments

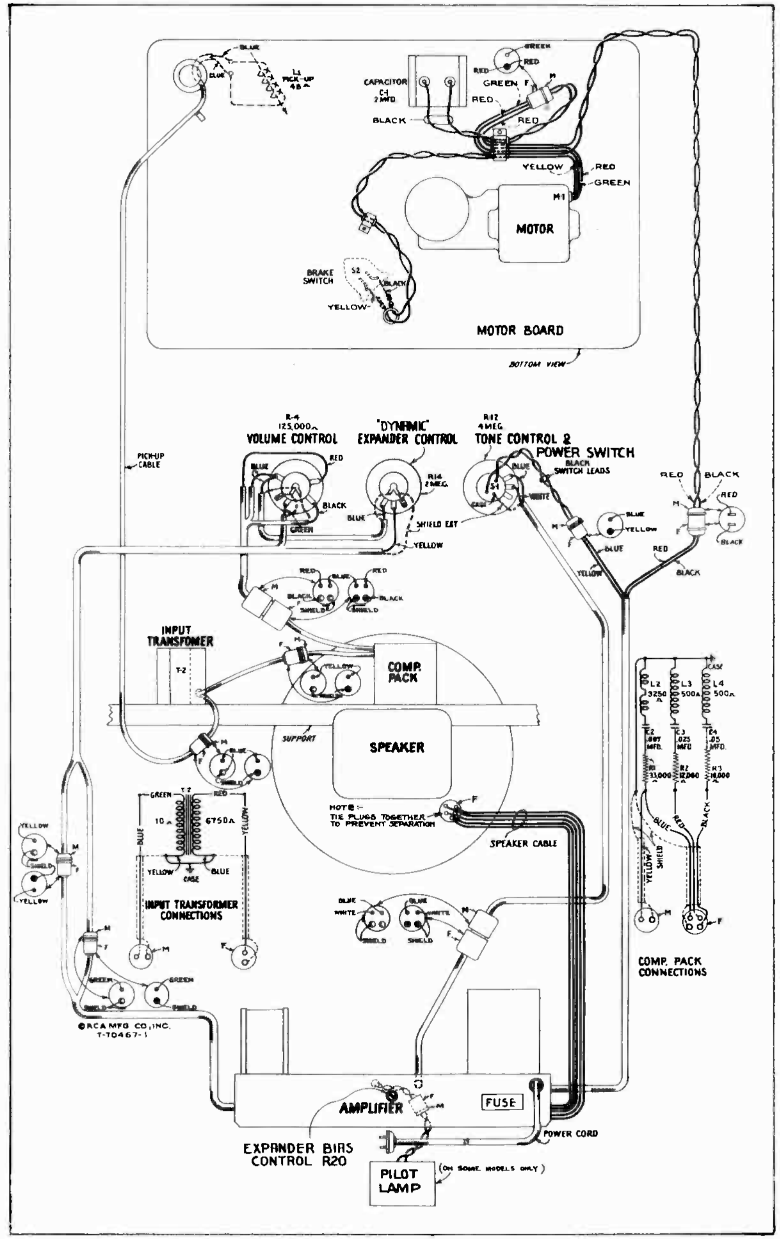


Figure 9—Assembly Wiring

the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

Phonograph Mechanism

The phonograph motor is of the synchronous type and is designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 8.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very

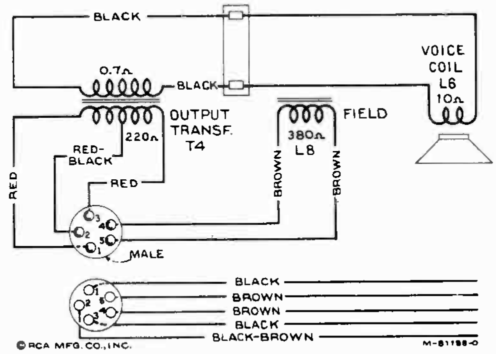


Figure 10—Loudspeaker Wiring

light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	Description	List Price	Stock No.	Description	List Price
	AMPLIFIER ASSEMBLIES		11332	Resistor—22,000 ohms, carbon type, 1 watt (R9)—Package of 5	1.10
11350	Cap—Grid contact cap—Package of 5	$0.20	12487	Resistor—33,000 ohms, carbon type, 2 watt (R8)	.25
12110	Cap—Top shield cap for 6L7 Radiotron	.14	12286	Resistor—56,000 ohms, insulated, 1/4 watt (R23)—Package of 5	1.00
12488	Capacitor—270 Mmfd. (C12, C13)	.20	12263	Resistor—100,000 ohms, insulated, 1/4 watt (R13, R16, R17, R19)—Package of 5	1.00
5107	Capacitor—.0025 Mfd. (C14, C26)	.16	12452	Resistor—330,000 ohms, insulated, 1/4 watt (R5)—Package of 5	1.00
4838	Capacitor—.005 Mfd. (C16, C17)	.20	12285	Resistor—470,000 ohms, insulated, 1/4 watt (R18)—Package of 5	1.00
5196	Capacitor—.035 Mfd. (C19)	.18	12486	Resistor—560,000 ohms, insulated, 1/4 watt (R7, R10)—Package of 5	1.00
4886	Capacitor—.05 Mfd. (C9)	.20	4794	Socket—4-contact 5Z3 or 2A3 Radiotron socket	.15
4518	Capacitor—.05 Mfd. (C5)	.52	11197	Socket—6 contact 6C5 Radiotron socket	.14
5170	Capacitor—.25 Mfd. (C11)	.25	11198	Socket—7-contact 6H6 or 6L7 Radiotron socket	.15
4840	Capacitor—.25 Mfd. (C15, C21)	.30	12464	Transformer—Interstage transformer (T3, L5)	5.95
11240	Capacitor—10 Mfd. (C24)	1.08	12463	Transformer—Power transformer, 110-120 volt, 50-60 cycle (T1)	8.58
12472	Capacitor—10 Mfd. (C10)	1.00		MISCELLANEOUS CABLES AND PLUGS	
5212	Capacitor—18 Mfd. (C8, C22)	1.16	12547	Cable—2-conductor shielded pickup cable, 25 inches long, complete less female connector, Stock No. 11488	.44
11496	Capacitor—18 Mfd. (C25)	1.15	12489	Cable—Power cable, approximately 30 inches long, complete with two female connectors	.58
12470	Capacitor—20 Mfd. (C6)	1.10	12563	Cable—Shielded input cable, approximately 9 inches long, complete with 4-contact male connector	.26
12467	Capacitor—30 Mfd. (C23)	1.40			
12465	Capacitor—Capacitor pack, comprising 3 sections, each 0.5 Mfd. (C7, C18, C20)	1.50			
11272	Clamp—Volume control or speaker cable clamp	.10			
5240	Cover—Fuse cover	.24			
12468	Expander—Control (R20)	1.00			
10907	Fuse—3-ampere fuse (F1)—Package of 5.	.40			
5239	Mounting—Fuse mounting	.36			
12471	Plate—6L7 socket mounting plate assembly, less socket	.15			
12466	Reactor—Filter reactor (L7)	2.35			
12206	Resistor—270 ohms, insulated, 1/4 watt (R6)—Package of 5	1.00			
12195	Resistor—2,200 ohms, insulated, 1/4 watt (R11, R15)—Package of 5	1.00			
12469	Resistor—4,600 ohms, wire wound (R22)	1.25			
11298	Resistor—5,600 ohms, carbon type, 1 watt (R21)	.22			

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	Description	List Price	Stock No.	Description	List Price
12564	Cable—Shielded tone control cable, approximately 20¼ inches long, with 4-contact male connector	.34	6122	Clamp—Brake switch cable clamp—Package of 15	.30
12490	Cable—Shielded tone control cable, approximately 14 inches long, complete with female connector	.58		MOTOR ASSEMBLIES	
12562	Cable—Shielded volume control cable, approximately 28 inches long, complete with 2 male connectors	.38	9693	Motor—105-125 volts, 50 cycles (M1)	40.85
12491	Cable—Shielded volume control cable, approximately 17 inches long, complete with 2 female connectors	.68	9692	Motor—105-125 volts, 60 cycles (M1)	40.85
12492	Cable—Speaker cable, approximately 40 inches long, complete with female connectors	.44	12551	Suspension Spring — Motor mounting spring, washer and stud assembly — comprising 6 springs, 6 cup washers, 3 spring washers and 3 studs	.45
4674	Connector—2-contact male connector for volume control cable, input transformer cable, compensator cable, motor leads, tone control switch leads and indicator lamp cable (socket end)	.25		AUTOMATIC SWITCH ASSEMBLIES	
11488	Connector—2-contact female connector for pickup cable, Stock No. 12547, or indicator lamp cable (chassis end)	.14	3994	Cover—Automatic switch cover and screw	.28
4577	Connector—2-contact male connector for motorboard power leads	.30	10184	Plate—Automatic brake trip latch plate with mounting screws—Package of 5	.40
12565	Connector—4-contact male tone control and input cable connector	.20	12550	Springs—Automatic brake springs—Package of 4	.16
12567	Connector—5-contact male connector plug for reproducer housing	.22	12549	Switch—Automatic brake and switch, complete	2.54
4573	Connector—Power cable 2-contact female connector with oblong openings	.30	3322	Switch—Switch only for automatic brake (S2)	.75
12493	Connector—Speaker cable 5-contact female connector	.20		REPRODUCER ASSEMBLIES	
12494	Connector—Tone control or compensator cable 4-contact female connector	.18	8059	Board—Reproducer terminal board (2 terminals)	.14
	PICKUP AND ARM ASSEMBLIES		8060	Bracket—Output transformer mounting bracket	.14
12542	Arm—Pickup arm, complete less pickup unit	6.50	8058	Clamp—Cone rim clamp—Package of 5	.44
11548	Back—Pickup back	.52	12566	Coil—Field coil, magnet and cone housing (L8)	11.10
10941	Ball—Pickup arm pivot shaft bearing—Package of 20	.25	12474	Cone—Reproducer cone (L6) — Package of 5	6.80
12543	Bracket—Pickup arm spring adjusting bracket and screw	.12	12569	Diffuser—Reproducer sound diffuser	.78
12541	Coil—Pickup coil (L1)	.64	9694	Reproducer—Reproducer, complete	18.25
3521	Cover—Pickup back cover with mounting screws	.18	12568	Transformer—Output transformer (T4)	3.30
11708	Cover—Pickup front cover	.15		MISCELLANEOUS ASSEMBLIES	
12850	Damper—Comprising one upper damper and bushing assembly, one lower bushing and one lower bearing	.25	12353	Adapter	.48
3390	Escutcheon—Pickup arm escutcheon and rivets	.46	12557	Bolt—Motorboard suspension bolt and spring assembly, consisting of 1 bolt, 1 C washer, 2 cup washers, 1 bottom spring, 1 top spring, 1 lockwasher and 1 cap nut	.38
14115	Mechanism—Comprising one armature and spring assembly, one armature clamp, and one damper	1.35	5211	Bolt—Reproducer mounting bolt assembly—Package of 2	.24
12538	Pickup—Pickup unit, complete	7.00	4594	Box—Used needle box	.30
12546	Plug—Pickup arm pivot shaft plug—Package of 2	.14	13103	Cap—Indicator lamp cap—Package of 5	.65
12545	Rod—Pickup arm trip rod and nut—Package of 5	.26	12561	Cap—Turntable spindle cap	.15
11549	Screw—Pickup front cover screw—Package of 10	.42	6122	Clamp—Volume control and pickup cables clamp—Package of 15	.30
12539	Screw—Pickup needle screw—Package of 10	.20	4420	Clamp—Volume control cable clamp—Package of 10	.40
3387	Screw—Screw, nut and washer for mounting pickup to arm—Package of 10	.50	12560	Compensator Pack—with 2 shielded cables, 1 male and 1 female connector assembled (C2, C3, C4, L2, L3, L4, R1, R2, R3)	3.74
12544	Spring—Pickup arm adjusting spring—Package of 10	.25	11580	Cover—Indicator lamp cover	.12
	MOTORBOARD ASSEMBLIES		11193	Cover—Reproducer cover	.82
12051	Capacitor—2 Mfd. motor capacitor, complete with cable and 2-contact male connector (C1)	4.18	12559	Cover—Turntable cover	.58
			12552	Expander Control (R14)	1.06
			11347	Knob—Expander, tone and switch or volume control knob—Package of 5	.75
			5226	Lamp—Indicator lamp—Package of 5	.70
			3396	Receptacle—Needle receptacle	.52
			11210	Screw—Amplifier mounting screw assembly—Package of 4	.28
			11573	Socket—Indicator lamp socket	.28
			11349	Spring—Retaining spring for knob, Stock No. 11347—Package of 5	.15
			12553	Tone control and switch (R12, S1)	1.12
			12555	Transformer—Input transformer, complete with 2 shielded cables, 1 male and 1 female connector assembled (T2)	6.00
			12558	Turntable—Complete	2.42
			12554	Volume Control (R4)	1.52

First Edition.

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL T9-7

Nine-Tube, Three-Band, A-C, D-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

Band A	540- 1,600 kc.
Band B	1,600- 5,500 kc.
Band C	5,500-18,000 kc.

ALIGNMENT FREQUENCIES

Band A	600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band B	None required
Band C	18,000 kc. (osc., det., ant.)

Intermediate Frequency .... **460 kc.**

RADIOTRON COMPLEMENT

(1)	RCA-6K7	Radio-Frequency Amplifier
(2)	RCA-6A8	First Detector-Oscillator
(3)	RCA-6K7	Intermediate Amplifier
(4)	RCA-6H6	Second Detector-A.V.C.
(5)	RCA-6F5	Audio Voltage Amplifier
(6)	RCA-25A6	Audio Power Amplifier
(7)	RCA-25A6	Audio Power Amplifier
(8)	RCA-6E5	Tuning Indicator
(9)	RCA-25Z6	Half-Wave Rectifier

POWER SUPPLY RATINGS

Rating (As shipped from Factory)	200-250 Volts, 40-100 Cycles, also D-C, 110 Watts
Rating (See note in text)	140-160 Volts, 40-100 Cycles, also D-C, 50 Watts

POWER OUTPUT (250-Volt Line)

Undistorted	2.25 Watts A-C, 1.75 Watts D-C
Maximum	3.00 Watts A-C, 2.30 Watts D-C

POWER OUTPUT (160-Volt Line)

Undistorted	0.90 Watts A-C, 0.75 Watts D-C
Maximum	1.25 Watts A-C, 0.95 Watts D-C

LOUDSPEAKER

Type	Electrodynamic
Voice Coil Impedance	2.25 Ohms at 400 Cycles

Mechanical Specifications

Height	$21\frac{3}{16}$ inches
Width	$15\frac{3}{4}$ inches
Depth	$9\frac{1}{2}$ inches
Weight (Net)	$27\frac{1}{2}$ pounds
Weight (Shipping)	33 pounds
Chassis Base Dimensions	$13\frac{7}{8}$ inches x $7\frac{5}{8}$ inches x $2\frac{1}{2}$ inches
Tuning Drive Ratios	10-to-1 and 50-to-1
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch-Tone

General Features

This instrument comprises a nine-tube chassis, mounted in a table type of cabinet. It uses the new metal tubes. The tuning range is from 540 to 18,000 kc. This coverage includes the important short-wave broadcast bands at 49, 31, 25, 19, and 16 meters, as well as the American broadcast band (540-1600 kc.). Chassis features include automatic volume control, cathode-ray tuning indicator ("Magic Eye"), 3-point tone control, antenna wave trap, and audio compensation. A high level of output is available from the receiver for reproduction by the 8-inch electrodynamic speaker. The tuning dial is an illuminated semi-airplane type. Each dial scale is distinctly marked with a separate color. Positions of the range selector knob are correspondingly indexed on the control panel with sections of similar colors. The tuning control is a dual-ratio type, which permits fast tuning through a 10-to-1 drive ratio and vernier tuning through a 50-to-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.

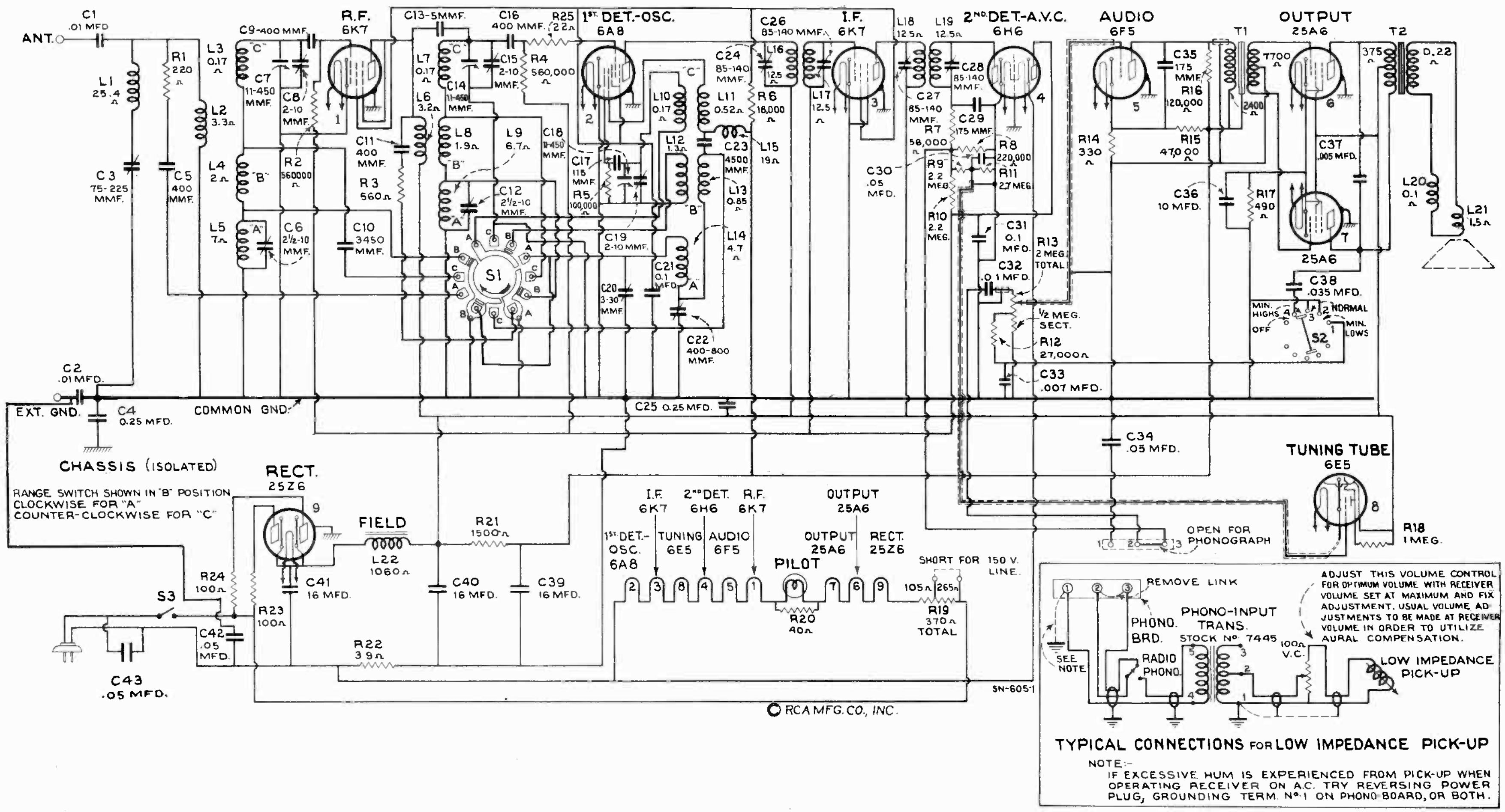


Figure 1—Schematic Circuit Diagram

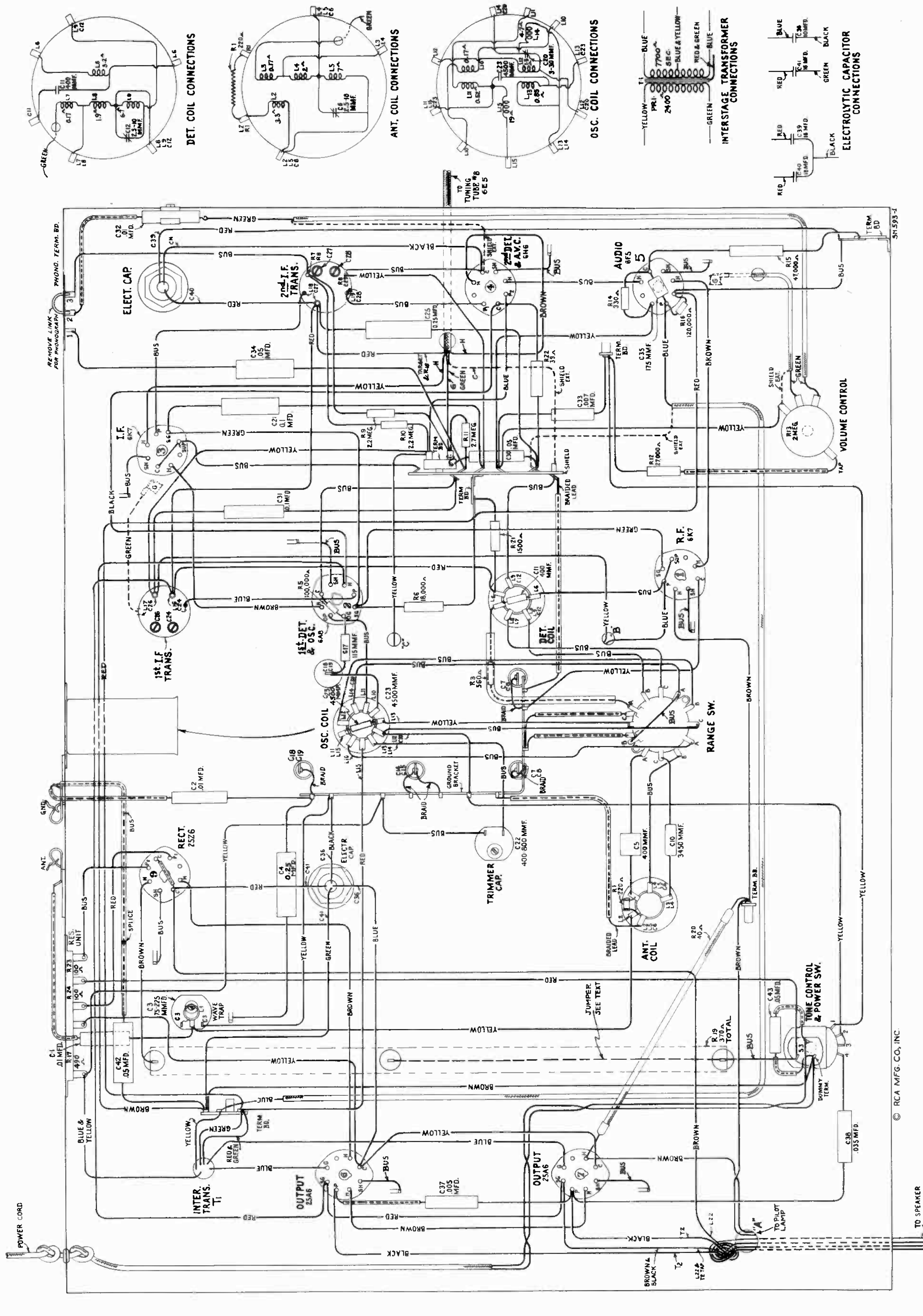


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional superheterodyne type of circuit is used. It consists of an r-f stage, a combined first detector-oscillator stage, a single i-f stage, a diode detector-automatic volume control stage, an audio voltage amplifier stage, a push-pull audio power output stage, a tuning indicator, and a half-wave rectifier power supply stage.

Tuned Circuits

The antenna coil system and the detector coil system each consist of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer capacitor.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-10, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c.-diode takes over the biasing function.

Audio System

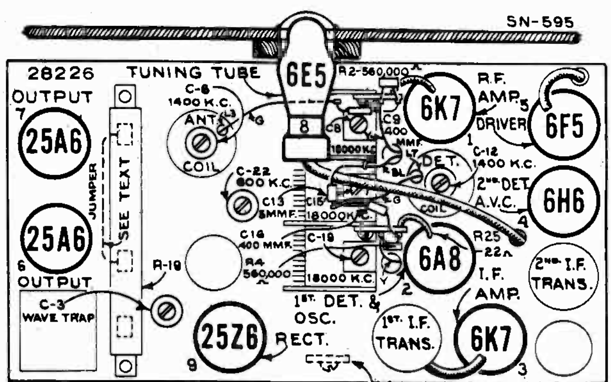
The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio-voltage-amplifier tube. This control has a tone-compensating filter connected to it, so that the correct aural balance will be obtained at different volume settings. Transformer coupling is used between the first audio stage and the push-pull power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of one of the output tubes. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S-2).

Tuning Indicator

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal.

NOTE: On a-c and d-c circuits of 160 volts or less, the action of the "Magic Eye" will be limited.

This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon



1400 K.C. OSC. (C-20) ADJ. CENTER REAR OF CHASSIS.

Figure 3—Radiotron, Coil and Trimmer Locations

R. F. Trimmer Adjustments

which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section, which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

Rectifier

The plate, grid, and cathode voltages required for the operation of this receiver are supplied by the RCA-25Z6 rectifier operating as a half-wave rectifier. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current.

The filaments of all nine tubes are connected in series and are fed direct from the supply line, the voltage being dropped to the required value by resistors R-19 and R-20. The correct operating voltage for the pilot lamp is developed across resistor R-20. This voltage across the pilot lamp will be slightly high when the receiver is first turned on, but will quickly drop to a normal value as soon as the tube filaments reach their operating temperature.

NOTE: (Power Supply Rating) As shipped from the factory, all instruments are connected for operation on a 200-250-volt supply line. They may be converted for operation at 140-160 volts by connecting a jumper between points shown by dotted line on resistor R-19, Figures 2 and 3.

SERVICE DATA

CAUTION: Grid caps, tuning condenser, and resistor on top of chassis may be "hot" with respect to external ground, and should be avoided when servicing, unless due precautions are taken.

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistances of less than one ohm are generally omitted.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system, two in the detector coil system, and two in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate, or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment, illustrated and described on a separate page of this booklet, may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The RCA Stock No. 9595 Full-Range Oscillator and the RCA Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors:

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator through a .05 mfd. condenser to the RCA-6A8 control grid, the ground of the test oscillator being connected to the receiver ground terminal. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, **C-27** and **C-28,** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, **C-24** and **C-26,** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The seven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by Figures 3 and 4. The three trimmers which are at all times directly in shunt with the variable tuning condenser necessitates that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The output indicator should be left connected to the output system as for i-f alignment. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the horizontal graduation (approximately 530 kc.) at the low-frequency end of the Band A scale.

Proceed further as follows:

(a) Adjust the test oscillator to **18,000 kc.** and set the receiver tuning control to a dial reading of **18,000 kc.**

(b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer, **C-19,** on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum The one of ***maximum trimmer capacitance*** is correct and should be used. (The oscillator will be **460 kc.** below the signal frequency at this adjustment point.)

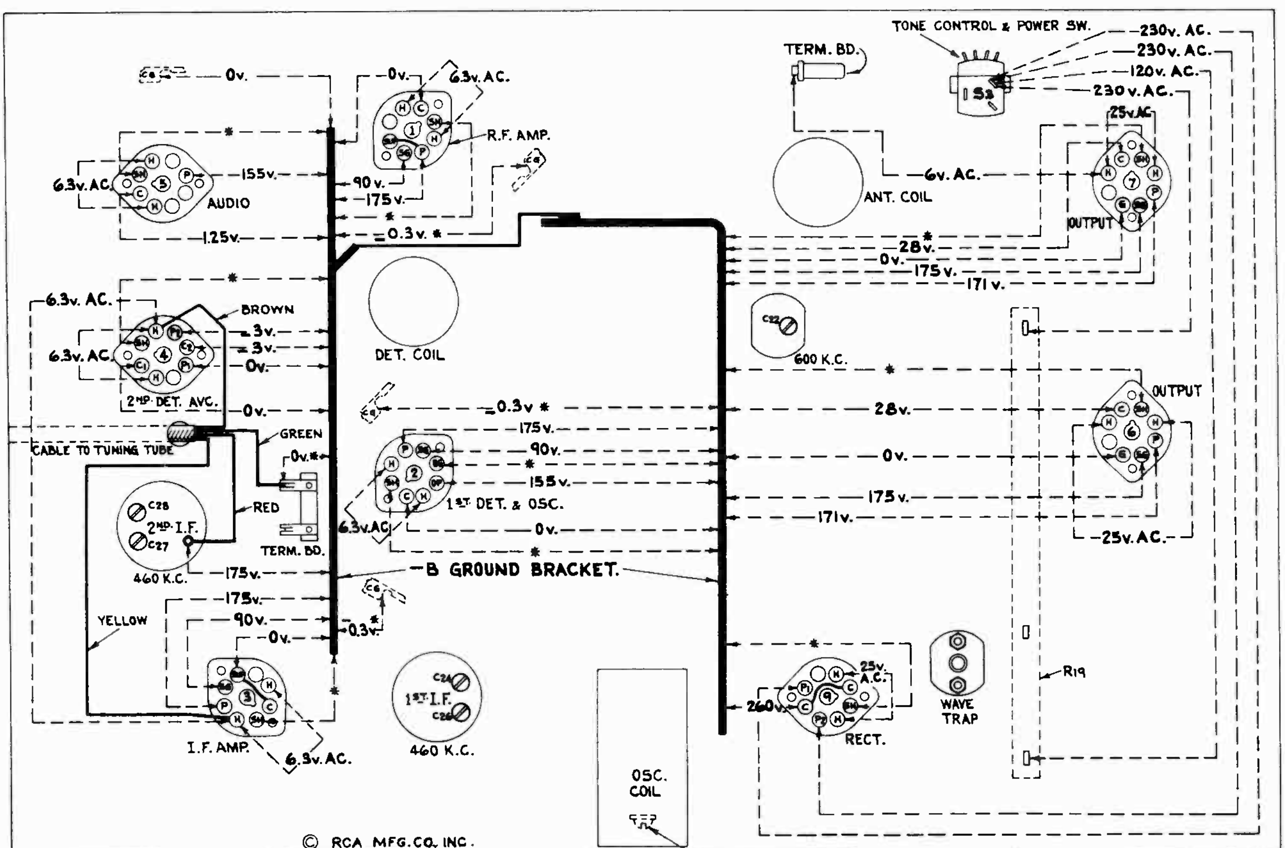
(c) Adjust the trimmer, **C-15,** of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **18,000 kc.** input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment, which would otherwise be caused by the interaction between the heterodyne oscillator circuit and the detector tuned circuit.

(d) With the receiver tuning control set to **18,000 kc.** adjust the trimmer, **C-8,** on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.

(e) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of **1,400 kc.** Tune the test oscillator to **1,400 kc.** and regulate its output to produce a slight indication on the receiver output indicating device.

(f) Adjust the high-frequency trimmers of the Band A oscillator, detector, and antenna coils, **C-20, C-12,** and **C-6** respectively, to the points at which each produces maximum indicated receiver output.

(g) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.



✱-CAN NOT BE MEASURED WITH ORDINARY VOLTMETER.

1400 K.C. OSC. (C-20) ADJ. CENTER REAR OF CHASSIS.

SN-604

Figure 4—Radiotron Socket Voltages

Measured at 230 volts, 60-cycle supply

Tuned to approximately 900 kc. (Band A)—No signal being received—Volume control setting optional

For 160-volt, 60-cycle supply, 30% lower; for 230-volt d-c supply, 13% lower; for 160-volt d-c supply, 35% lower

(h) Tune the low-frequency trimmer, **C-22**, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of **C-19, C-15**, and **C-8** should be corrected at **18,000 kc.** as in (b), (c), and (d); also **C-20, C-12** and **C-6** should be corrected at **1,400 kc.** as in (f) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to –B ground bracket on Figure 4 will assist in the location of causes for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 900 kc. (Band A); no signal being received, and volume control setting optional. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Voltages below 10 read on 10-volt scale, between 10 and 50 on 50-volt scale, and between 50 and 250 on 250-volt scale. A-C voltages were measured with a corresponding a-c meter.

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. A typical method of connection is shown on the schematic diagram (Figure 1). Correct procedure to be observed for adjustment of attachment to secure proper aural compensation is indicated.

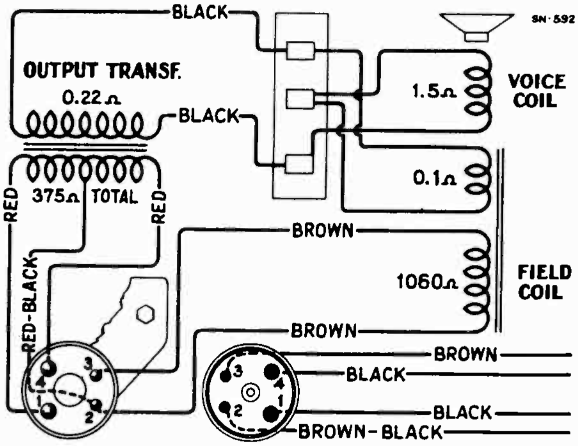


Figure 5—Loudspeaker Wiring

Wave Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43
12066	Board—Terminal board assembly and link	.25
12068	Cable—Tuning tube cable and socket	.56
11465	Capacitor—Adjustable capacitor—(C22)	.48
12077	Capacitor—5 Mmfd.—(C13)	.42
11291	Capacitor—115 Mmfd.—(C17)	.24
11623	Capacitor—175 Mmfd.—(C35)	.18
11290	Capacitor—400 Mmfd.—(C5, C9, C16)	.25
12076	Capacitor—3,450 Mmfd.—(C10)	.42
4868	Capacitor—.005 Mfd.—(C37)	.20
5148	Capacitor—.07 Mfd.—(C33)	.20
4858	Capacitor—.01 Mfd.—(C1, C2)	.25
11395	Capacitor—.01 Mfd.—(C32)	.18
5196	Capacitor—.035 Mfd.—(C38)	.18
4836	Capacitor—.05 Mfd.—(C30)	.30
12078	Capacitor—.05 Mfd.—(C34, C42)	.30
12480	Capacitor—.05 Mfd.—(C43)	.30
5170	Capacitor—0.25 Mfd.—(C4, C25)	.25
4835	Capacitor—0.1 Mfd.—(C21)	.28
4841	Capacitor—0.1 Mfd.—(C31)	.22

Stock No.	DESCRIPTION	List Price
12055	Capacitor Pack—Comprising 2 sections of 16 Mfd.—(C39, C40)	$3.75
12056	Capacitor Pack—Comprising 1 section of 16 Mfd. and one section of 10 Mfd.—(C36, C41)	2.95
11600	Coil—Antenna coil—(L2, L3, L4, L5, C6, R1)	1.78
12059	Coil—Detector coil—(L6, L7, L8, L9, C11, C12)	1.94
11602	Coil—Oscillator coil—(L10, L11, L12, L13, L14, L15, C20, C23)	2.15
11385	Condenser—3-gang variable tuning condenser—(C7, C8, C14, C15, C18, C19)	5.02
12057	Dial—Station selector dial	.75
11394	Foot—Chassis foot and bracket assembly—Package of 2	.70
11893	Indicator—Station selector indicator pointer	.28
4340	Lamp—Dial lamp—Package of 5	.60
12053	Resistor—Line resistor—Comprising one 265-ohm and one 105-ohm sections—(R19)	.58

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
12058	Resistor—Comprising 2 sections of 100 ohms and one section of 490 ohms—(R17, R23, R24)	$0.90	12081	Transformer—Interstage transformer—(T1)	$4.52
11624	Resistor—22 ohms—flexible type—complete with contact cap—(R25)	.22	11391	Trap—Wave trap (L1, C3)	1.22
11956	Resistor—39 ohms—carbon type—½ watt—(R22)—Package of 5	1.00	11237	Volume Control—(R13)	1.20
12074	Resistor—40 ohms—flexible type—(R20)	.30		**REPRODUCER ASSEMBLIES**	
11296	Resistor—330 ohms—carbon type—¼ watt—(R14)—Package of 5	1.00	11232	Board—Terminal board with two lead wire clips	.18
11324	Resistor—560 ohms—carbon type—¼ watt—(R3)—Package of 5	1.00	11231	Bolt—Yoke and core assembly bolt and nut	.16
3047	Resistor—1,500 ohms—carbon type—½ watt—(R21)—Package of 5	1.00	8060	Bracket—Output transformer mounting bracket	.14
3219	Resistor—18,000 ohms—carbon type—½ watt—(R6)—Package of 5	1.00	11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.18
11400	Resistor—27,000 ohms—carbon type—¼ watt—(R12)—Package of 5	1.00	12079	Coil—Field coil—(L22)	1.88
12073	Resistor—47,000 ohms—carbon type—1 watt—(R15)—Package of 5	1.10	11233	Coil—Neutralizing coil—(L20)	.30
11281	Resistor—100,000 ohms—carbon type—1/10 watt—(R5)—Package of 5	.75	11235	Cone—Reproducer cone—(L21)—Package of 5	3.50
12355	Resistor—120,000 ohms—carbon type—1/10 watt—(R16)—Package of 5	.75	5040	Connector—4-contact female connector for reproducer cable	.25
11397	Resistor—560,000 ohms—carbon type—1/10 watt—(R2, R4)—Package of 5	.75	5039	Connector—4-contact male connector for reproducer	.25
11626	Resistor—2.2 megohms—carbon type—¼ watt—(R9, R10)—Package of 5	1.00	9643	Reproducer—Complete	6.50
12072	Resistor—2.7 megohms—carbon type—¼ watt—(R11)—Package of 5	1.00	12080	Transformer—Output transformer—(T2)	1.70
11603	Shield—Antenna or detector coil shield for Stock Nos. 11600 and 12059	.26	11886	Washer—Spring washer—used to hold field coil securely—Package of 5	.20
11390	Shield—Intermediate frequency transformer shield	.25		**MISCELLANEOUS ASSEMBLIES**	
11604	Shield—Oscillator coil shield for Stock No. 11602	.24	11996	Clamp—Tuning tube mounting bracket and clamp assembly	.22
3529	Socket—Dial lamp socket	.32	11276	Escutcheon—Tuning tube escutcheon	.40
11198	Socket—7-contact Radiotron socket	.15	11376	Escutcheon—Station selector escutcheon and crystal	.70
11196	Socket—8-contact 6A8 Radiotron socket	.15	11582	Knob—Range switch knob—Package of 5	.50
12054	Switch—Range switch (S1)	1.16	11610	Knob—Station selector knob assembly—Comprising 1 large and 1 small knob—Package of 5	1.00
11392	Switch—Tone control and power switch assembly (S2, S3)	1.14	11347	Knob—Volume control or power switch knob—Package of 5	.75
5238	Terminal—Antenna terminal board with clip insulating strip and rivets	.14	11382	Resistor—1 megohm—carbon resistor—1/10 watt—(R18)—Package of 5	.75
11976	Terminal—Ground terminal clip assembly	.15	11377	Screw—Chassis mounting screw assembly—Package of 4	.12
11388	Transformer—First intermediate frequency transformer—(L16, L17, C24, C26)	1.90	11381	Socket—Tuning tube socket and cover	.45
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C27, C28, C29, R7, R8)	3.02	11349	Spring—Retaining spring for knob Stock Nos. 11347 and 11582 and small knob in No. 11610—Package of 5	.15
			4982	Spring—Retaining spring for large knobs—for Stock No. 11610—Package of 10	.26

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead at the antenna terminal. Interference in the form of "beats" from a combination of local stations may frequently be remedied by tuning the wave trap to one of the interfering stations. The wave trap will tune from approximately 375 kc. to 700 kc.

(2) In the event that unsatisfactory service is obtained from the standard rectifier, an RCA type 25Z6-G may be used for replacement.

(3) Low sensitivity and reduced signal pickup may be due to poor alignment. Note that heterodyne oscillator tracks below signal on "C" band.

RCA VICTOR MODEL T9-8

Nine-Tube, Three-Band, A-C, D-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

Band X .... 155- 320 kc.
Band A .... 530- 1,500 kc.
Band C ....5,400-18,000 kc.

ALIGNMENT FREQUENCIES

Band X....180 kc. (osc.), 300 kc. (osc., det., ant.)
Band A....600 kc. (osc.), 1,400 kc. (osc., det., ant.)
Band C................18,000 kc. (osc., det., ant.)

Intermediate Frequency ....460 kc.

RADIOTRON COMPLEMENT

(1) RCA-6K7..........Radio-Frequency Amplifier
(2) RCA-6A8............First Detector-Oscillator
(3) RCA-6K7.............Intermediate Amplifier
(4) RCA-6H6...........Second Detector-A.V.C.
(5) RCA-6F5............Audio Voltage Amplifier
(6) RCA-25A6...........Audio Power Amplifier
(7) RCA-25A6...........Audio Power Amplifier
(8) RCA-6E5..................Tuning Indicator
(9) RCA-25Z6..............Half-Wave Rectifier

POWER SUPPLY RATINGS

Rating (As shipped from Factory) ....200-250 Volts, 40-100 Cycles, also D-C, 110 Watts
Rating (See note in text) ....140-160 Volts, 40-100 Cycles, also D-C, 50 Watts

POWER OUTPUT (250-Volt Line)

Undistorted ....2.25 Watts A-C, 1.75 Watts D-C
Maximum ......3.00 Watts A-C, 2.30 Watts D-C

POWER OUTPUT (160-Volt Line)

Undistorted ....0.90 Watts A-C, 0.75 Watts D-C
Maximum ......1.25 Watts A-C, 0.95 Watts D-C

LOUDSPEAKER

Type ....Electrodynamic

Voice Coil Impedance.....2.25 Ohms at 400 Cycles

Mechanical Specifications

Height ....$21\frac{3}{16}$ inches
Width ....$15\frac{3}{4}$ inches
Depth .... $9\frac{1}{2}$ inches
Weight (Net) ....$27\frac{1}{2}$ pounds
Weight (Shipping) ....33 pounds
Chassis Base Dimensions ....$13\frac{7}{8}$ inches x $7\frac{7}{8}$ inches x $2\frac{1}{2}$ inches
Tuning Drive Ratios ....10-to-1 and 50-to-1
Operating Controls ....(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch-Tone

General Features

This instrument comprises a nine-tube chassis, mounted in a table type of cabinet. It uses the new metal tubes. The tuning range is from 155 to 320 kc.; from 530 to 1,500 kc.; and from 5,400 to 18,000 kc. This coverage includes the important short-wave bands at 49, 31, 25, 19 and 16 meters, the European long-wave band (150-320 kc.) and the American broadcast band (530-1,500 kc.). Chassis features include automatic volume control, cathode-ray tuning indicator ("Magic Eye"), 3-point tone control, antenna wave trap, and audio compensation. A high level of output is available from the receiver for reproduction by the 8-inch electrodynamic speaker. The tuning dial is an illuminated semi-airplane type. Each dial scale is distinctly marked with a separate color. Positions of the range selector knob are correspondingly indexed on the control panel with sections of similar colors. The tuning control is a dual-ratio type, which permits fast tuning through a 10-to-1 drive ratio and vernier tuning through a 50-to-1 drive ratio. The latter is especially advantageous for accurate tuning of the short-wave stations.

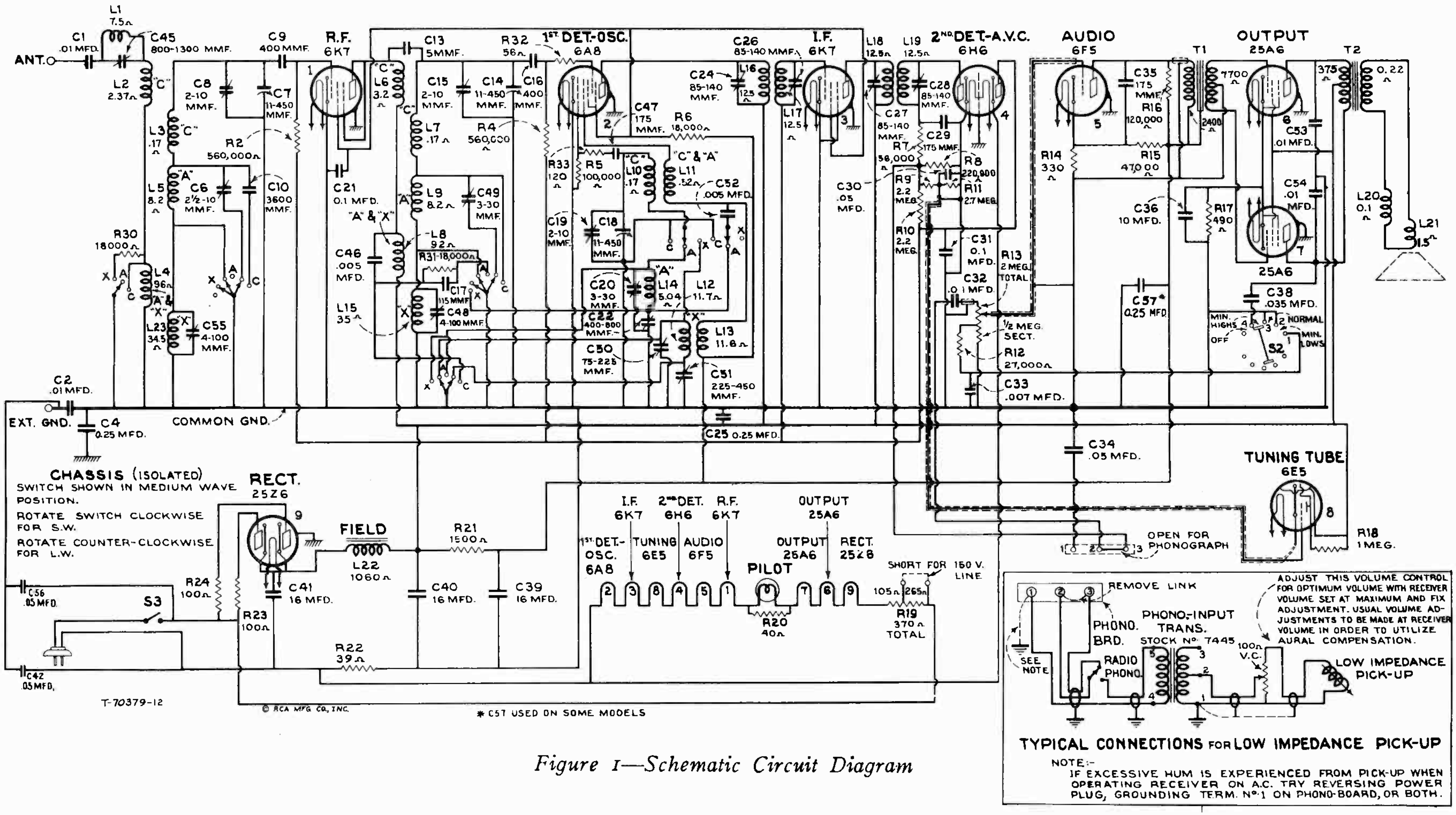


Figure 1—Schematic Circuit Diagram

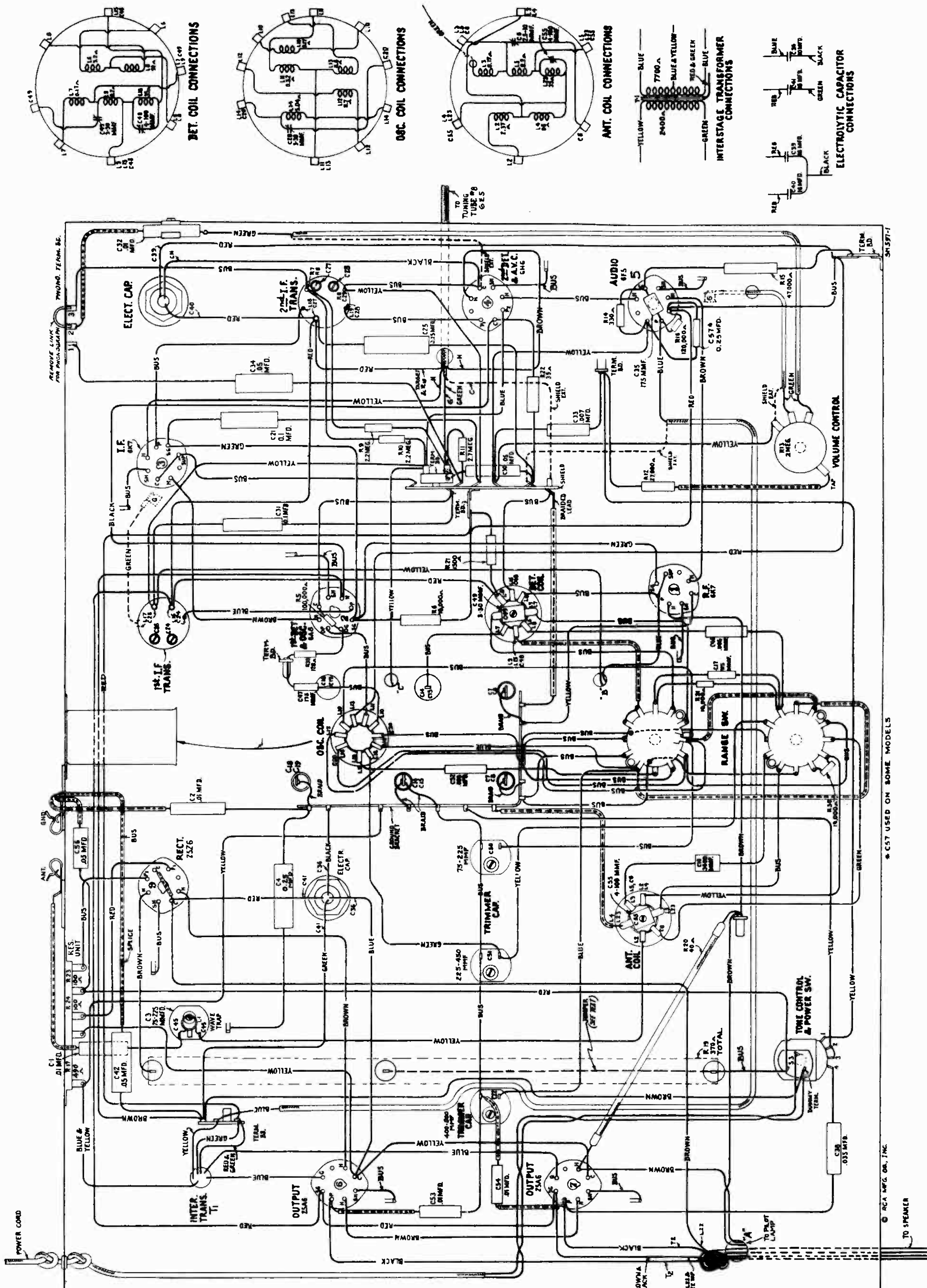


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional superheterodyne type of circuit is used. It consists of an r-f stage, a combined first detector-oscillator stage, a single i-f stage, a diode detector-automatic volume control stage, an audio voltage amplifier stage, a push-pull audio power output stage, a tuning indicator, and a half-wave rectifier power supply stage.

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The antenna coil system and the detector coil system each consist of two series-connected primary windings and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimming capacitors in shunt with each section. There are additional trimming capacitors across the section of each Band "A" coil and each Band "X" coil. Series trimming capacitors are also associated with the Band "A" and Band "X" oscillator coils.

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The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-8 and R-10, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c.-diode takes over the biasing function.

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A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal.

NOTE: On a-c and d-c circuits of 160 volts or less, the action of the "Magic Eye" will be limited.

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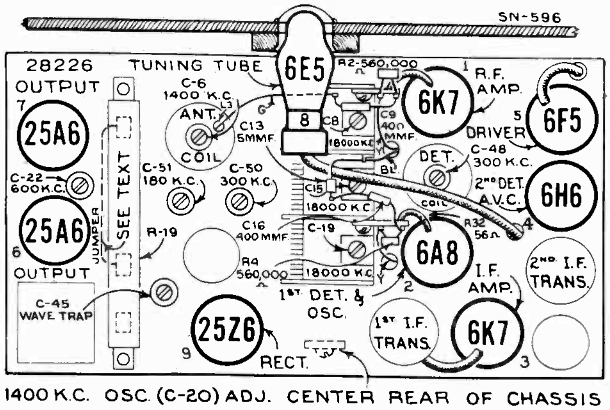


Figure 3—Radiotron, Coil and Trimmer Locations

Rectifier

The plate, grid, and cathode voltages required for the operation of this receiver are supplied by the RCA-25Z6 rectifier operating as a half-wave rectifier. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current.

The filaments of all nine tubes are connected in series and are fed direct from the supply line, the voltage being dropped to the required value by resistors R-19 and R-20. The correct operating voltage for the pilot lamp is developed across resistor R-20. This voltage across the pilot lamp will be slightly high when the receiver is first turned on, but will quickly drop to a normal value as soon as the tube filaments reach their operating temperature.

NOTE: (Power Supply Rating) As shipped from the factory, all instruments are connected for operation on a 200-250-volt supply line. They may be converted for operation at 140-160 volts by connecting a jumper between points shown by dotted line on resistor R-19, Figures 2 and 3.

SERVICE DATA

CAUTION: Grid caps, tuning condenser, and resistor on top of chassis may be "hot" with respect to external ground, and should be avoided when servicing, unless due precautions are taken.

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistances of less than one ohm are generally omitted.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, five in the oscillator coil system, three in the detector coil system, and three in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate, or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The RCA Stock No. 9595 Full-Range Oscillator and the RCA Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors:

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator through a .05 mfd. condenser to the RCA-6A8 control grid, the ground of the test oscillator being connected to the receiver ground terminal. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers, **C-27** and **C-28,** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, **C-24** and **C-26,** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The eleven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by Figures 3 and 4. The three trimmers which are at all times directly in shunt with the variable tuning condenser necessitate that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The output indicator should be left connected to the output system as for i-f alignment. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the horizontal graduation (approximately 530 kc.) at the low-frequency end of the Band A scale.

Proceed further as follows:

(a) Adjust the test oscillator to **18,000 kc.** and set the receiver tuning control to a dial reading of **18,000 kc.**

(b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer, **C-19,** on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of ***maximum trimmer capacitance*** is correct and should be used. (The oscillator will be **460 kc.** below the signal frequency at this adjustment point.)

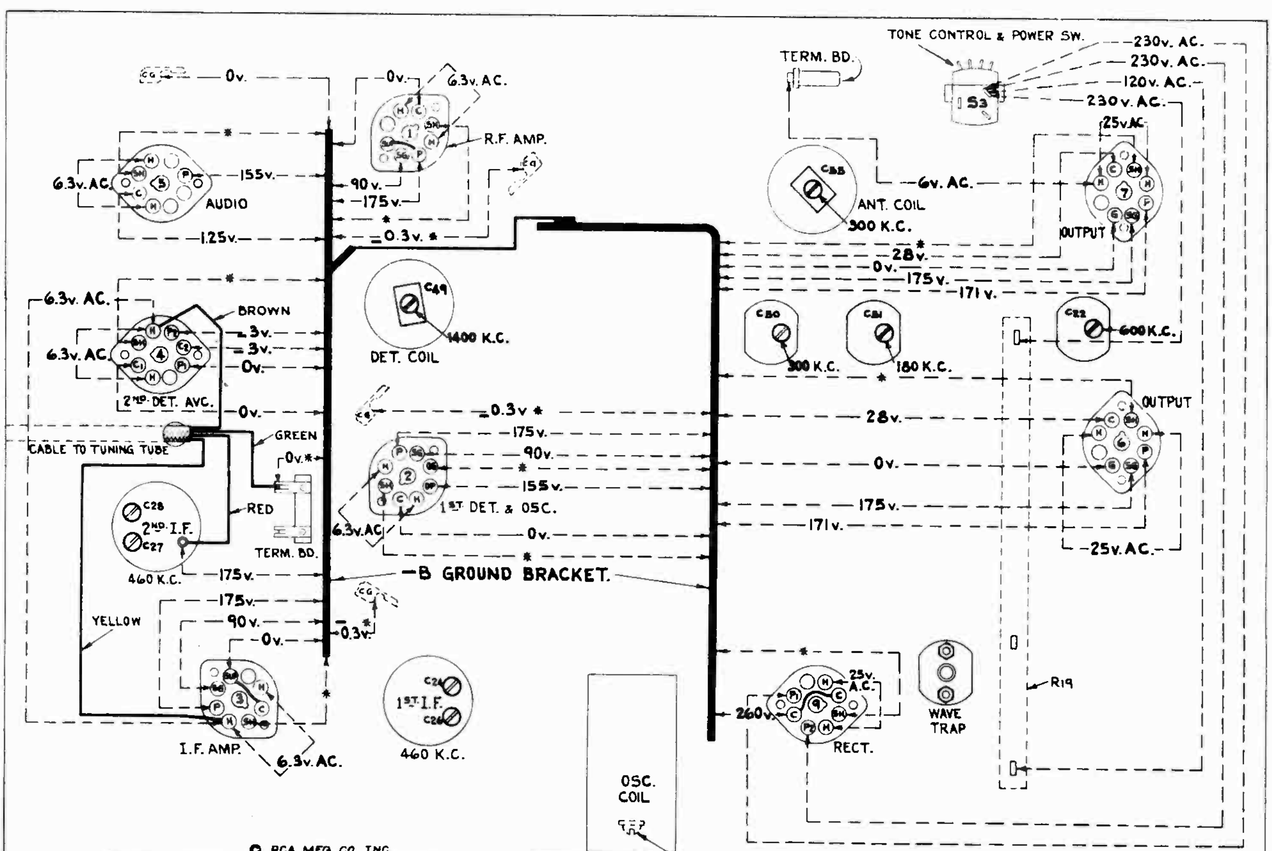
(c) Adjust the trimmer, **C-15,** of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **18,000 kc.** input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment, which would otherwise be caused by the interaction between the heterodyne oscillator circuit and the detector tuned circuit.

(d) With the receiver tuning control set to **18,000 kc.** adjust the trimmer, **C-8,** on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.

(e) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of **1,400 kc.** Tune the test oscillator to **1,400 kc.** and regulate its output to produce a slight indication on the receiver output indicating device.

(f) Adjust the high-frequency trimmers of the Band A oscillator, detector, and antenna coils, **C-20, C-49,** and **C-6** respectively, to the points at which each produces maximum indicated receiver output.

(g) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.



* - CAN NOT BE MEASURED WITH ORDINARY VOLTMETER.

1400 K.C. OSC. (C-20) ADJ. CENTER REAR OF CHASSIS.

SN-606

Figure 4—Radiotron Socket Voltages

Measured at 230 volts, 60-cycle supply

Tuned to approximately 900 kc. (Band A)—No signal being received—Volume control setting optional

For 160-volt, 60-cycle supply, 30% lower; 230-volt d-c supply, 13% lower; 160-volt d-c supply, 35% lower.

(h) Tune the low-frequency trimmer, **C-22**, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations.

(i) Change the receiver range selector to its Band "X" position and set the receiver tuning control to a dial reading of **300 kc.**, set the test oscillator to **300 kc.** and regulate its output to produce a slight indication on the receiver output indicating device.

(j) Adjust the high-frequency trimmers of the Band "X" oscillator, detector and antenna coils, **C-50, C-48,** and **C-55** respectively, to the points at which each produces maximum indicated receiver output.

(k) Shift the test oscillator to **180 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(l) Tune the low-frequency trimmer **C-51** of the oscillator Band "X" coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations.

(m) The adjustment of **C-19, C-15,** and **C-8** should be corrected at **18,000 kc.** as in (b), (c) and (d).

(n) The adjustment of **C-20, C-49** and **C-6** should be corrected at **1,400 kc.** as in (f) to compensate for any change caused by adjustment of the low-frequency oscillator coil trimmer.

(o) The adjustment of **C-50, C-48,** and **C-55** should be corrected at **300 kc.** as in (j) to compensate for any changes caused by the low-frequency oscillator coil trimmer.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to –B ground bracket on Figure 4 will assist in the location of causes for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 900 kc. (Band A); no signal being received, and volume control setting optional. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Voltages below 10 read on 10-volt scale, between 10 and 50 on 50-volt scale, and between 50 and 250 on 250-volt scale. A-C voltages were measured with a corresponding a-c meter.

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. A typical method of connection is shown on the schematic diagram (Figure 1). Correct procedure to be observed for adjustment of attachment to secure proper aural compensation is indicated.

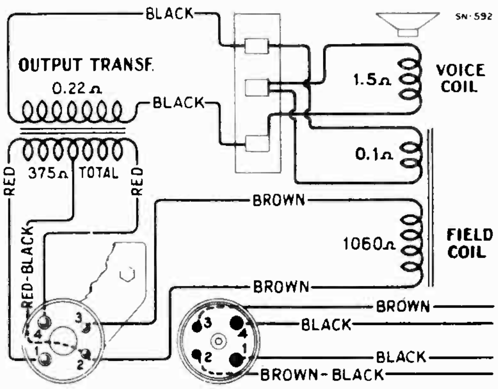


Figure 5—Loudspeaker Wiring

Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES		11290	Capacitor—400 Mmfd.—(C9, C16)	$0.25
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	$0.43	11621	Capacitor—3,600 Mmfd.—(C10)	.38
			4868	Capacitor—.005 Mfd.—(C46, C52)	.20
			5148	Capacitor—.007 Mfd.—(C33)	.20
12066	Board—Terminal board assembly and link	.25	4858	Capacitor—.01 Mfd. (C1, C2, C53, C54)	.25
12068	Cable—Tuning tube cable and socket	.56	11395	Capacitor—.01 Mfd.—(C32)	.18
11256	Capacitor—Adjustable capacitor—(C50)	.48	5196	Capacitor—.035 Mfd.—(C38)	.18
11465	Capacitor—Adjustable capacitor—(C22)	.48	4836	Capacitor—.05 Mfd.—(C30)	.30
12065	Capacitor—Adjustable capacitor—(C51)	.65	12078	Capacitor—.05 Mfd.—(C34, C42)	.30
12077	Capacitor—5 Mmfd.—(C13)	.42	12480	Capacitor—.05 Mfd.—(C56)	.30
11291	Capacitor—115 Mmfd.—(C17)	.24	5170	Capacitor—0.25 Mfd.—(C4, C25, C57)	.25
11623	Capacitor—175 Mmfd.—(C35, C47)	.18	4835	Capacitor—0.1 Mfd.—(C21)	.28

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
4841	Capacitor—0.1 Mfd.—(C31)	$0.22
12055	Capacitor Pack—Comprising 2 sections of 16 Mfd.—(C39, C40)	3.75
12056	Capacitor Pack—Comprising 1 section of 16 Mfd. and one section of 10 Mfd.—(C36, C41)	2.95
12061	Coil—Antenna coil—(L2, L3, L4, L5, L23, C6, C55)	1.90
12062	Coil—Detector coil—(L6, L7, L8, L9, L15, C48, C49)	1.94
12063	Coil—Oscillator coil (L10, L11, L12, L13, L14, C20)	2.62
12067	Condenser—3-gang variable tuning condenser—(C7, C8, C14, C15, C18, C19)	4.85
12131	Dial—Station selector dial scale	.75
11394	Foot—Chassis foot and bracket assembly—Package of 2	.70
11893	Indicator—Station selector indicator pointer	.28
4340	Lamp—Dial lamp—Package of 5	.60
12053	Resistor—Line resistor—Comprising one 265-ohm and one 105-ohm sections—(R19)	.58
12058	Resistor—Comprising 2 sections of 100 ohms and one section of 490 ohms—(R17, R23, R24)	.90
11956	Resistor—39 ohms—carbon type—½ watt—(R22)—Package of 5	1.00
12074	Resistor—40 ohms—flexible type—(R20)	.30
12075	Resistor—56 ohms—flexible type, complete with contact cap—(R32)	.28
12071	Resistor—120 ohms—carbon type—¼ watt—(R33)—Package of 5	1.00
11296	Resistor—330 ohms—carbon type—¼ watt—(R14)—Package of 5	1.00
3047	Resistor—1,500 ohms—carbon type—½ watt—(R21)—Package of 5	1.00
3219	Resistor—18,000 ohms—carbon type—½ watt—(R6)—Package of 5	1.00
12070	Resistor—18,000 ohms—carbon type—1/10 watt—(R30, R31)—Package of 5	.75
11400	Resistor—27,000 ohms—carbon type—¼ watt—(R12)—Package of 5	1.00
12073	Resistor—47,000 ohms—carbon type—1 watt—(R15)—Package of 5	1.10
11281	Resistor—100,000 ohms—carbon type—1/10 watt—(R5)—Package of 5	.75
12355	Resistor—120,000 ohms—carbon type—1/10 watt—(R16)—Package of 5	.75
11397	Resistor—560,000 ohms—carbon type—1/10 watt—(R2, R4)—Package of 5	.75
11626	Resistor—2.2 megohms—carbon type—¼ watt—(R9, R10)—Package of 5	1.00
12072	Resistor—2.7 megohms—carbon type—¼ watt—(R11)—Package of 5	1.00
12064	Shield—Antenna or detector coil shield—for stock Nos. 12061 and 12062	.28
11390	Shield—Intermediate frequency transformer shield	.25
11604	Shield—Oscillator coil shield for Stock No. 12063	.24
3529	Socket—Dial lamp socket	.32
11198	Socket—7-contact Radiotron socket	.15
11196	Socket—8-contact 6A8 Radiotron socket	$0.15
12060	Switch—Range switch	1.00
11392	Switch—Tone control and power switch assembly (S2, S3)	1.14
5238	Terminal—Antenna terminal board with clip insulation strip and rivets	.14
11976	Terminal—Ground terminal clip assembly	.15
11388	Transformer—First intermediate frequency transformer—(L16, L17, C24, C26)	1.90
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C27, C28, C29, R7, R8)	3.02
12081	Transformer—Interstage transformer—(T1)	4.52
11667	Trap—Wave trap—(L1, C45)	1.22
11237	Volume Control—(R13)	1.20
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.18
12079	Coil—Field coil—(L22)	1.88
11233	Coil—Neutralizing coil—(L20)	.30
11235	Cone—Reproducer cone—(L21)—Package of 5	3.50
5040	Connector—4-contact female connector for reproducer cable	.25
5039	Connector—4-contact male connector for reproducer	.25
9643	Reproducer—Complete	6.50
12080	Transformer—Output transformer—(T2)	1.70
11886	Washer—Spring washer—used to hold field coil assembly—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
11996	Clamp—Tuning tube mounting bracket and clamp assembly	.22
11276	Escutcheon—Tuning tube escutcheon	.40
11376	Escutcheon—Station selector escutcheon and crystal	.70
11582	Knob—Range switch knob—Package of 5	.50
11610	Knob—Station selector knob assembly—Comprising 1 large and 1 small knob—Package of 5	1.00
11347	Knob—Volume control or power switch knob—Package of 5	.75
11382	Resistor—1 megohm—carbon type—1/10 watt—(R18)—Package of 5	.75
11377	Screw—Chassis mounting screw assembly—Package of 4	.12
11381	Socket—Tuning tube socket and cover	.45
11349	Spring—Retaining spring for knob Stock Nos. 11347 and 11582 and small knob in No. 11610—Package of 5	.15
4982	Spring—Retaining spring for large knobs—for Stock No. 11610—Package of 10	.26

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead at the antenna terminal. Interference in the form of "beats" from a combination of local stations may frequently be remedied by tuning the wave trap to one of the interfering stations.

(2) In the event that unsatisfactory service is obtained from the standard rectifier, an RCA type 25Z6-G may be used for replacement.

(3) Low sensitivity and reduced signal pickup may be due to poor alignment. Note that heterodyne oscillator tracks below signal on "C" band.

RCA VICTOR MODEL 4T

Four-Tube, Single-Band, A-C, Superheterodyne-Reflex Receiver

TECHNICAL INFORMATION

Electrical Specifications

Radiotron Complement

(1) RCA-6A7............First Detector–Oscillator
(2) RCA-6B7....I-F., 2nd Det., Audio, and A.V.C.
(3) RCA-41........................Power Output
(4) RCA-1V.................Half-Wave Rectifier

Frequency Range..........540-1,720 kc.
Intermediate Frequency..........460 kc.
Alignment Frequencies..........460 kc. (I.F.), 1,500 kc. (antenna and oscillator)

Power Supply Ratings

Rating A..........105-125 volts, 50-60 cycles, 50 watts
Rating B..........105-125 volts, 25-60 cycles, 50 watts
Rating C..........100-130/140-160/195-250 volts, 40-60 cycles, 50 watts

Power Output

Undistorted..........1.75 watts
Maximum..........2.5 watts

Loudspeaker

Type..........Electrodynamic
Impedance (V.C.)..........3.2 ohms at 400 cycles

Pilot Lamp..........Mazda No. 46, 6.3 volts, 0.25 amperes

Mechanical Specifications

Cabinet Dimensions

Height..............14¾ inches Width...............11¼ inches Depth..............6¼ inches
Weight (Net)..........13 pounds Weight (Shipping)..........16 pounds
Chassis Base Dimensions..........9¾ inches x 5½ inches x 2 inches
Over-all Height of Chassis..........6½ inches
Operating Controls..........(1) Tuning, (2) Power Switch—Volume

General Features

This model contains a four-tube chassis mounted in a table-type cabinet. The superheterodyne circuit is used, incorporating such features of design as automatic volume control, magnetite core adjusted i-f transformers, diode detection, reflexed audio system, electrodynamic speaker, and improved antenna wave-trap. The frequency range extends from 540 to 1,720 kc. which covers the regular broadcast band and includes police calls in the 1,600 to 1,720 kc. portion of the range.

Circuit Description

Four Radiotrons are associated in combination with a superheterodyne circuit. Two of the Radiotrons are applied so as to obtain plural functions. The first tube, an RCA-6A7 pentagrid converter tube, is employed as a combination first detector and oscillator. The second tube, an RCA-6B7, performs the functions of i-f amplification, diode detection, audio amplification, and automatic volume control. A power-amplifier pentode, RCA-41, is used in the output stage.

Half-wave rectification is used in the power-supply stage. The speaker field winding serves as a reactor in the filter circuit.

The radio-frequency and intermediate-frequency stages are intercoupled by means of transformers. The antenna transformer couples directly into the first detector, having its secondary tuned by one section (front) of the two-gang tuning condenser. The oscillator system is tuned by the second (rear) section

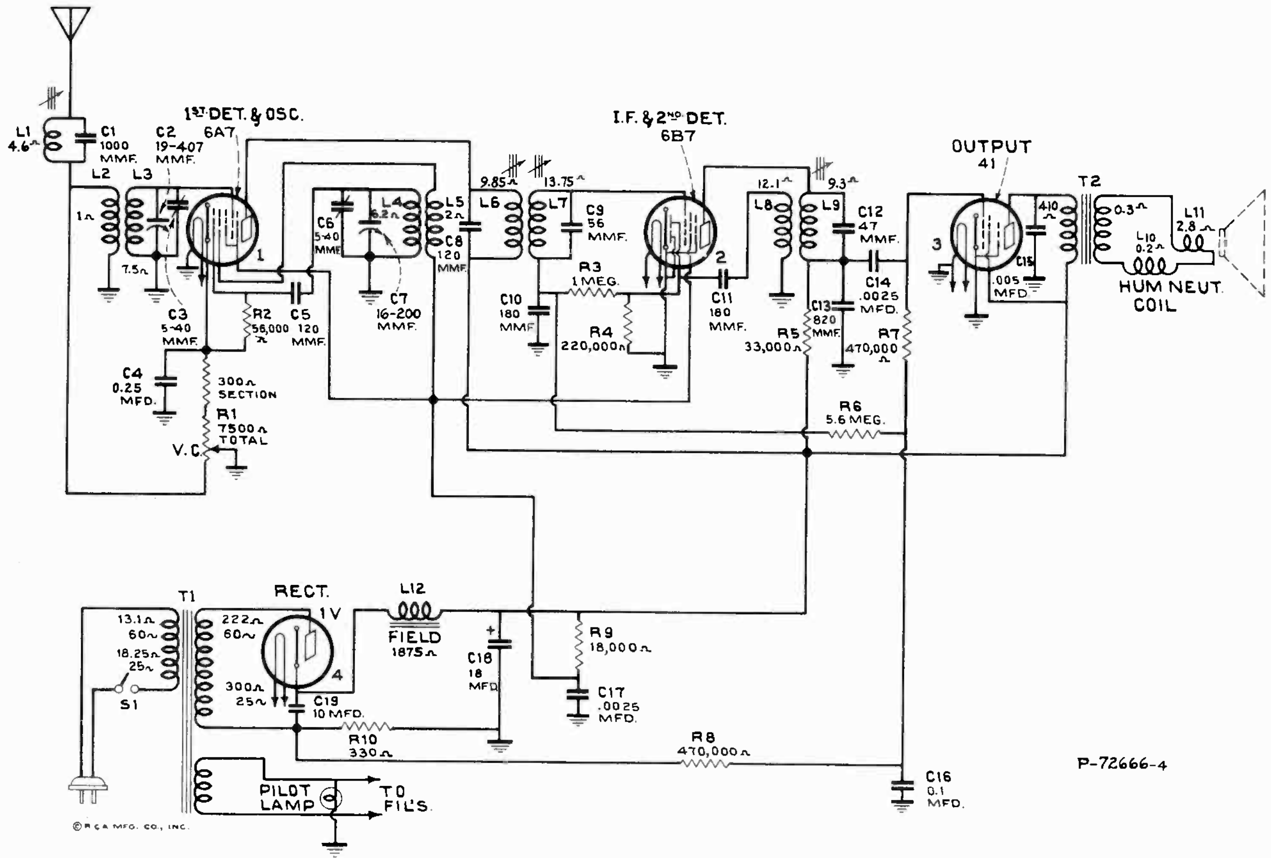


Figure 1—Schematic Circuit Diagram

* On some instruments C-4 is .05 mfd. Make all replacements with Stock No. 4840.

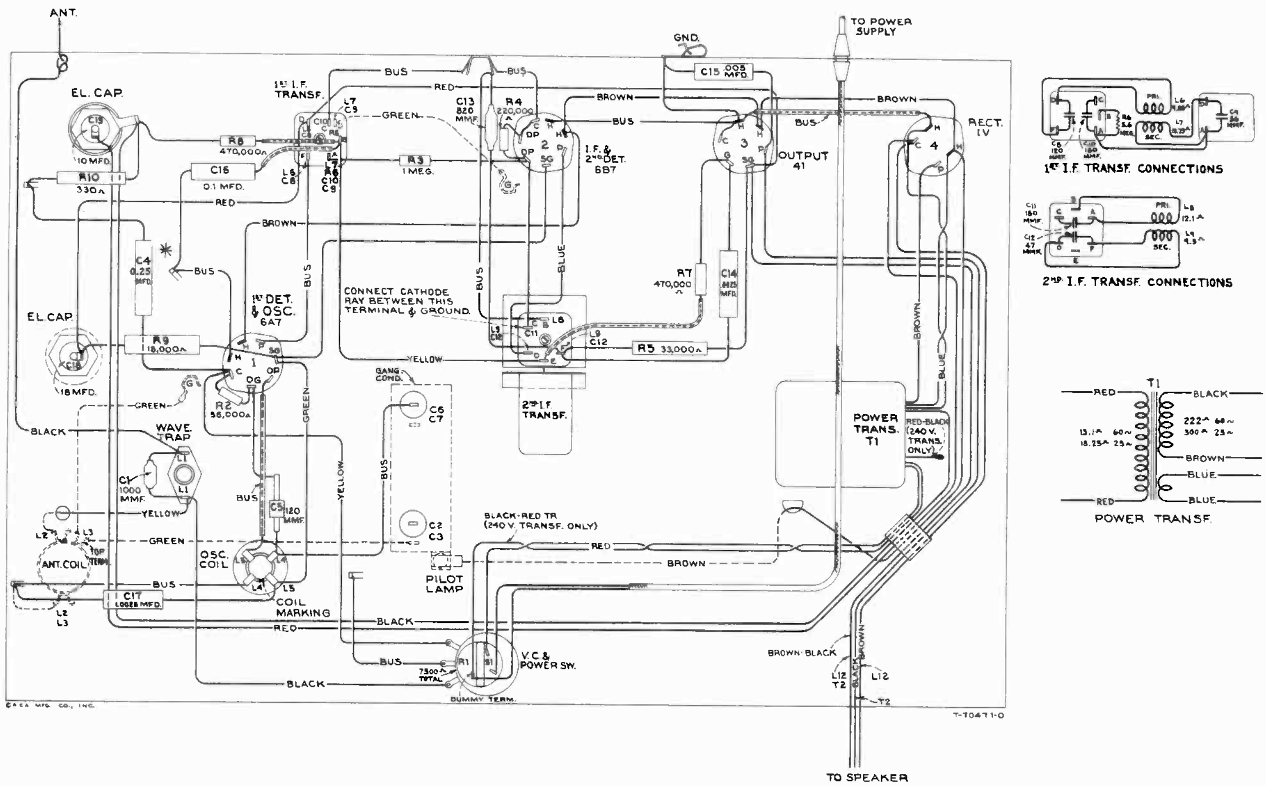


Figure 2—Chassis Wiring Diagram

of the condenser. Adjustable magnetite-core trimmers are provided for adjusting the inductance of the windings of the input i-f transformer (primary and secondary) and the output transformer (primary) so as to resonate at 460 kc. with the fixed capacitors shunting these respective coils. The i-f signal originating in the first-detector circuit is transferred to the control grid of the RCA-6B7, amplified in the pentode section, coupled back to the diode section of this same tube where it is rectified before passing through resistor R-4. A fraction of the audio component developed across resistor R-4 appears across resistor R-6 from whence it is transferred to the control grid of the Radiotron 6B7 through winding L-7; L-7 and capacitor C-10 offering low and high reactance respectively to audio frequencies. The amplified audio signal, in the plate circuit of the RCA-6B7, developed across resistor R-5 is coupled to the control grid of the power-output tube for final amplification. The output of this stage is coupled to the loudspeaker through the output transformer T-4. The d-c signal component, of the diode rectified current, developed across resistor R-4, increases the bias of the RCA-6B7, thereby reducing its gain and giving A.V.C. action.

SERVICE DATA

NOTE: Oscillation may occur in receiver if external ground connection is not used.

The various diagrams of this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams.

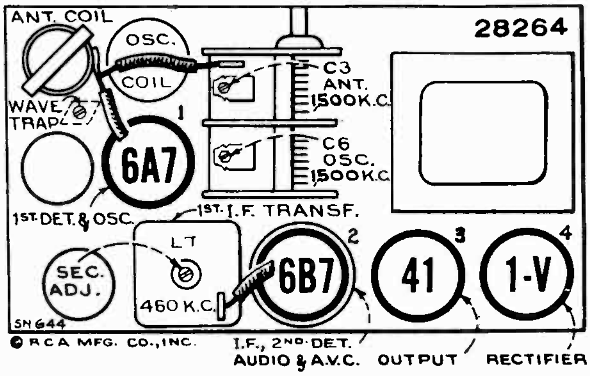


Figure 3—Radiotron, Coil, and Trimmer Locations

Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are two alignment trimmers provided in the antenna coil and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of three screws attached to molded magnetite cores.

All of the adjustable circuits of this receiver have been properly aligned at the factory to give correct performance and their settings should remain intact indefinitely when the receiver is used under ordinary conditions. However, necessity for re-adjustment may occasionally occur from continued extremes of temperature, climate, tampering or purported alteration for services, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure, and to use adequate and reliable test equipment.. A standard test oscillator such as the RCA Stock No. 9595 will be required as the source of the signal at the specified alignment frequencies. Visual indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. The RCA Stock No. 4317 Neon Output Indicator is especially suitable for this use.

The following procedure should be observed in adjusting the various trimming capacitors and molded magnetite cores:

I-F Core Adjustments

The three adjustment screws (one on top and one on bottom of first i-f transformer and one on bottom of second i-f transformer) are located as shown by Figures 3 and 7. Each circuit must be aligned to a basic frequency of 460 kc. To do this, attach the output indicator across the loudspeaker voice coil or across the output transformer primary. Connect the output of the test oscillator to the RCA-6A7 control grid, the ground of the test oscillator being connected to the receiver ground terminal. Adjust the test oscillator to **460 kc.** Advance the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or local oscillator. Set the volume control to its maximum position. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Adjust the bottom screw of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the two screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device.

During these adjustments, regulate the test oscillator output so the indication is always as low as possible. By doing so, broadness of tuning, due to A.V.C. action, will be avoided. It is advisable to repeat the adjustment of all i-f screws to assure that the interaction between them has not disturbed the original adjustment.

Wave-Trap Adjustment

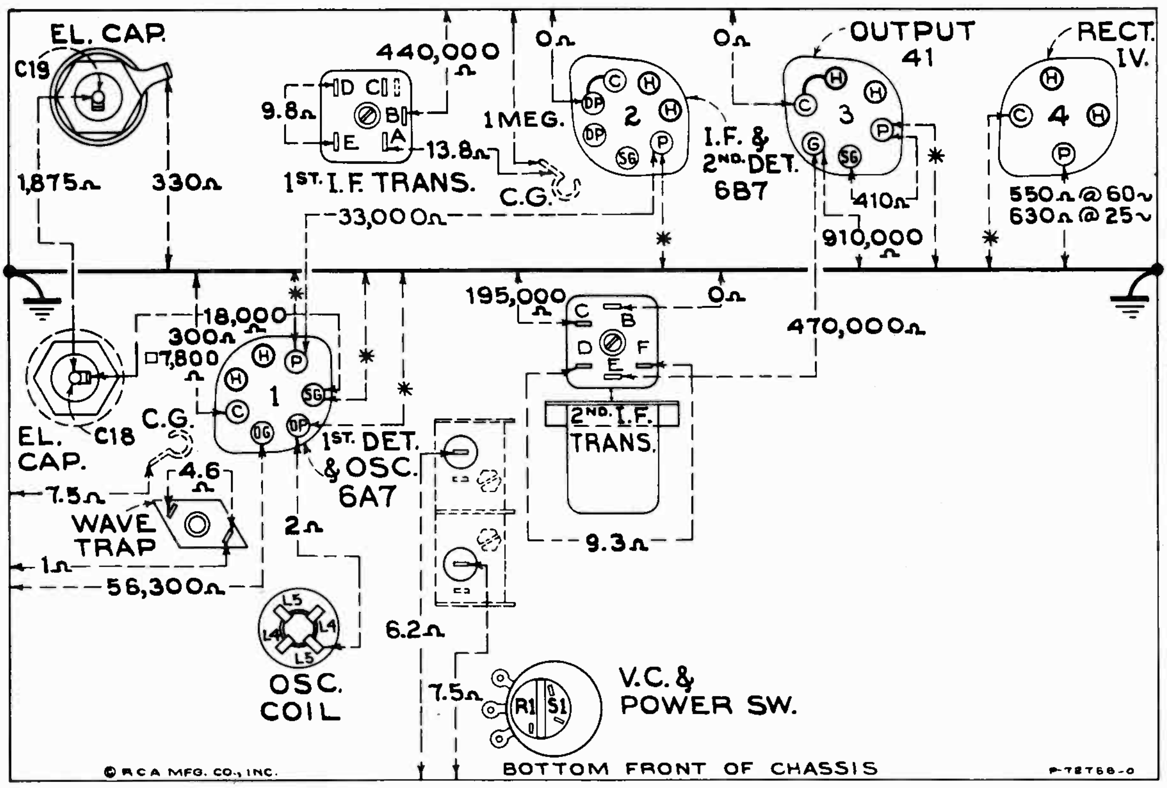
Attach the output of the test oscillator to the black antenna lead through a 300-ohm resistor, the ground connection of the test oscillator remaining the same. Leave the test oscillator adjusted to **460 kc.** as before. Turn the rotor plates of the two-gang tuning condenser completely out of mesh. Then adjust the wave-trap trimmer to the point which causes maximum suppression of the 460 **kc.** signal.

R-F Trimmer Adjustments

Calibrate the tuning dial by first loosening its set screw and then rotating dial until the extreme end calibration mark (beyond 55 on dial) is in alignment with the dial shadow-indicator while the two-gang tuning condenser plates are in full mesh. Re-tighten set screw.

The output meter should be left connected to the output system. The connections for the test oscillator remain the same as for "Wave-trap adjustment."

Adjust the test oscillator to **1,500 kc.** and set the receiver tuning control to a dial reading of **1,500 kc.** Leave the volume control at its maximum position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimming capacitors C-6 and C-3 of the oscillator and antenna coils, Figure 3, so that each produces maximum (peak) receiver output.



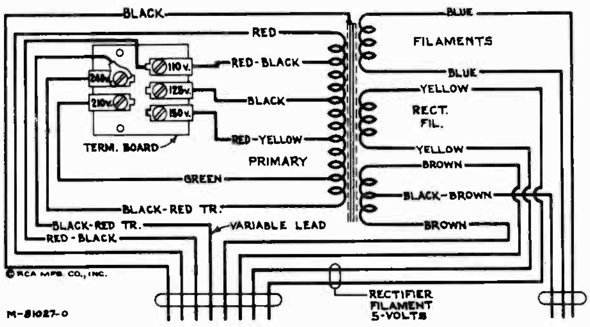
NOTE: □ VOLUME CONTROL AT "MIN." POSITION.
* OPEN CIRCUIT (LEAKAGE OF ELECTROLYTIC CAPACITORS ONLY).

Figure 4—Resistance Diagram

Power Supply Disconnected—Radiotrons in sockets—Tuning Condenser in full mesh—Volume Control Maximum

Resistance Measurement

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on Figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, Figure 1, and Chassis Wiring Diagram, Figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm 20\%$. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with the Radiotrons in sockets; tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.



Primary Resistance - 23.6 ohms Total
Secondary Resistance - 180 ohms Total

Figure 5—Universal Transformer

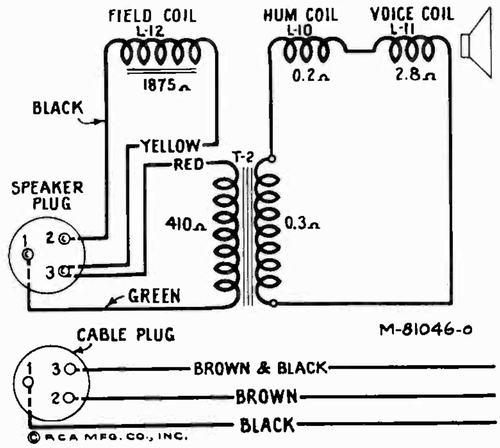
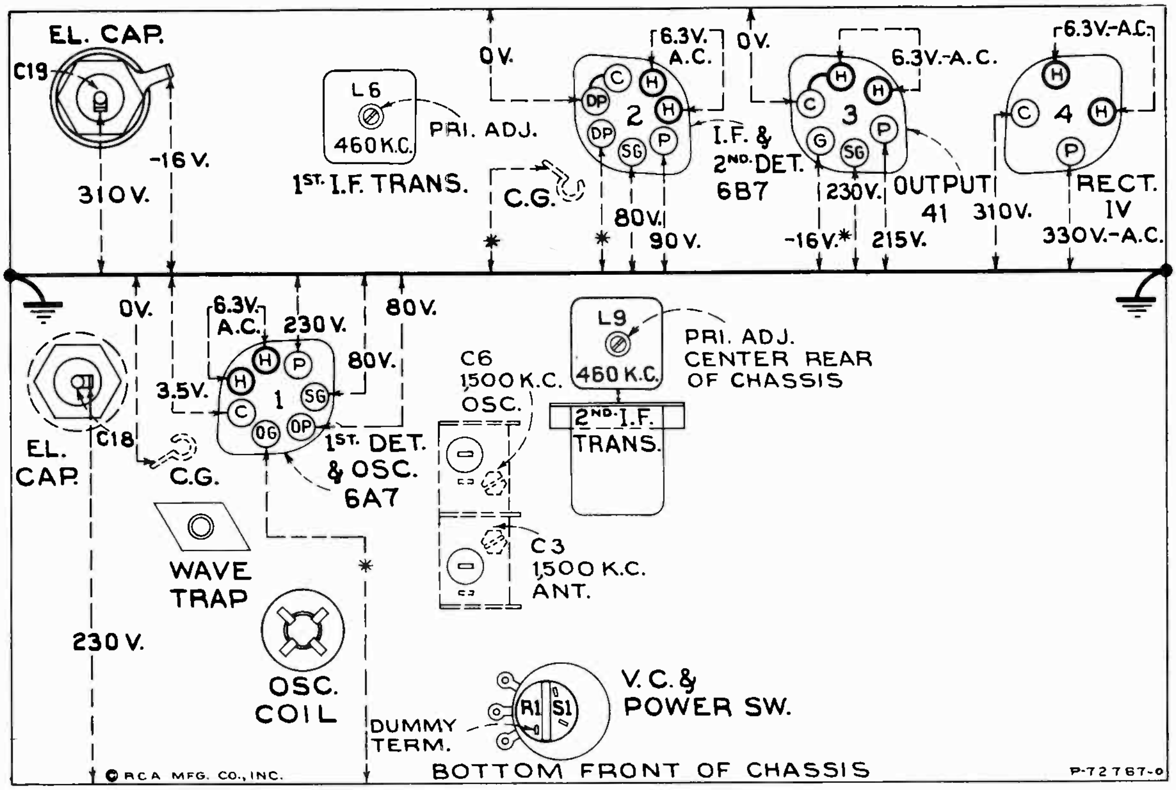


Figure 6—Loudspeaker Wiring



✱ CANNOT BE MEASURED WITH ORDINARY VOLTMETER.

Figure 7—Radiotron Socket Voltages and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc.—No signal being received—Volume Control Maximum

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on Figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc., no signal being received and volume control set at maximum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the voltage to be measured. A-C voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
6956	Cap—Radiotron shield top for Stock No. 3942	.15
12118	Cap—Grid contact cap—Package of 5	.15
12405	Capacitor—47 Mmfd. (C12)	.26
12629	Capacitor—56 Mmfd. (C9)	.20
12404	Capacitor—120 Mmfd. (C8)	.26
12634	Capacitor—120 Mmfd. (C5)	.20
12406	Capacitor—180 Mmfd. (C10, C11)	.26
12536	Capacitor—820 Mmfd. (C13)	.25
12635	Capacitor—1,000 Mmfd. (C1)	.25
5107	Capacitor—.0025 Mfd. (C14, C17)	.16
4838	Capacitor—.005 Mfd. (C15)	.20
4841	Capacitor—0.1 Mfd. (C16)	.22
4840	Capacitor—0.25 Mfd. (C4)	.30
11240	Capacitor—10 Mfd. (C19)	1.08
5212	Capacitor—18 Mfd. (C18)	1.16
11661	Coil—Antenna coil (L2, L3)	.52
11662	Coil—Oscillator coil (L4, L5)	.56
12624	Condenser—2-gang variable tuning condenser (C2, C3, C6, C7)	2.50
12006	Core—Core and stud assembly for Stock Nos. 12627, 12630 and 12631	.22
12632	Dial—Indicator dial scale	.45
12626	Indicator—Tuning indicator for Stock No. 12625—Package of 10	.22
4340	Lamp—Dial lamp—Package of 5	.60
11670	Resistor—330 ohms, carbon type, 1 watt (R10)—Package of 5	1.10
11671	Resistor—18,000 ohms, carbon type, 2 watt (R9)	.22
11669	Resistor—33,000 ohms, carbon type, 1 watt (R5)—Package of 5	1.10
12286	Resistor—56,000 ohms, Insulated, ¼ watt (R2)—Package of 5	1.00
12264	Resistor—220,000 ohms, Insulated, ¼ watt (R4)—Package of 5	1.00
12285	Resistor—470,000 ohms, Insulated, ¼ watt (R7, R8)—Package of 5	1.00
12200	Resistor—1 megohm, Insulated, ¼ watt (R3)—Package of 5	1.00
12628	Resistor—5.6 megohm, carbon type, 1/10 watt (R6)—Package of 5	.75
12633	Screw—Set screw for dial, Stock No. 12632—Package of 10	.18
12008	Shield—First I.F. transformer shield	.28
12607	Shield—First I.F. transformer shield cap	.30
11126	Shield—Oscillator coil shield	.12
3942	Shield—Radiotron shield	.18
12408	Shield—Second I.F. transformer shield	.28
4794	Socket—4-contact rectifier RCA-1V Radiotron socket	.15
4786	Socket—6-contact RCA-41 Radiotron socket	.15
4787	Socket—7-contact RCA-6A7 or RCA-6B7 Radiotron socket	.15
12625	Socket—Dial lamp socket, bracket and indicator	.28
12007	Spring—Retaining spring for Stock No. 12006—Package of 10	.36
12627	Transformer—First I.F. transformer (L6, L7, C8, C9, C10, R6)	1.84
11664	Transformer—Power transformer, 105-125 volts, 50-60 cycles (T1)	3.60
11665	Transformer—Power transformer, 105-125 volts, 25-60 cycles (T1)	5.06
11666	Transformer—Power transformer, 100-130, 140-160, 195-250 volts, 40-60 cycles	3.80
12630	Transformer—Second I.F. transformer (L8, L9, C11, C12)	1.44
12631	Trap—Wave trap (L1)	.65
11663	Volume Control—Volume control and operating switch (R1, S1)	1.20
	REPRODUCER ASSEMBLIES	
12446	Coil—Neutralizing coil (L10)	.22
12576	Coil—Reproducer field coil (L12)	1.70
12574	Cone—Reproducer cone complete (L11)	1.35
5118	Connector—3-contact male connector plug for Reproducer	.25
5119	Connector—3-contact female connector plug for Reproducer	.25
9698	Reproducer, complete	5.70
12575	Transformer—Output transformer (T2)	1.60
	MISCELLANEOUS ASSEMBLIES	
11347	Knob—Station selector knob—Package of 5	.75
12638	Knob—Volume control knob—Package of 5	.58
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12638—Package of 5	.15

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Hum or distortion when tuned to a station may be due to improper connection of resistor R-2.

First Edition.

RCA VICTOR MODELS 4X, 4X3, and 4X4

Four-Tube, Single-Band, AC-DC, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGE
"Standard Broadcast" (A) .... 540-1,720 kc

ALIGNMENT FREQUENCIES
"Standard Broadcast" (A) ... 1,500 kc (osc. and ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-6A7 .... First Detector–Oscillator
(2) RCA-6F7 .... I. F. and Second Detector
(3) RCA-43 .... Power Output
(4) RCA-25Z5 .... Half-wave Rectifier

Power Supply Rating (105-125 volts) .... 50-60 cycles—55 watts, D.C.—50 watts

POWER OUTPUT
Undistorted .... 0.3 watts A.C., 0.25 watts D.C.
Maximum .... 0.8 watts A.C., 0.6 watts D.C.

LOUDSPEAKER
Type .... Electrodynamic
Impedance (v.c.) {M80864-1, 4.5 ohms / M80864-2, 3.0 ohms} at 400 cycles

Pilot Lamp .... Mazda No. 40, 6.3 volts, 0.15 ampere

Mechanical Specifications

CABINET DIMENSIONS	MODEL 4X	MODEL 4X3	MODEL 4X4
Height	10⅞ inches	12 inches	10½ inches
Width	8 5/16 inches	7½ inches	7⅜ inches
Depth	5⅝ inches	5⅛ inches	5⅝ inches
WEIGHTS			
Net	9 pounds	9 pounds	8½ pounds
Shipping	11 pounds	11 pounds	10½ pounds

Chassis Base Dimensions .... 9¼ inches x 4⅝ inches x 1½ inches
Over-all Height of Chassis .... 5¾ inches
Operating Controls .... (1) Power Switch-Volume, (2) Tuning

General Features

Each model contains a four-tube chassis mounted in a table-type cabinet. The superheterodyne type of circuit is used, with such features of design as magnetite core adjusted i-f transformers, improved core adjusted antenna wave-trap, illumination of full-vision dial scale, resistance-coupled audio system, and an electrodynamic loudspeaker. The tuning range covers from 540 to 1,720 kc which includes the standard-broadcast and one police band.

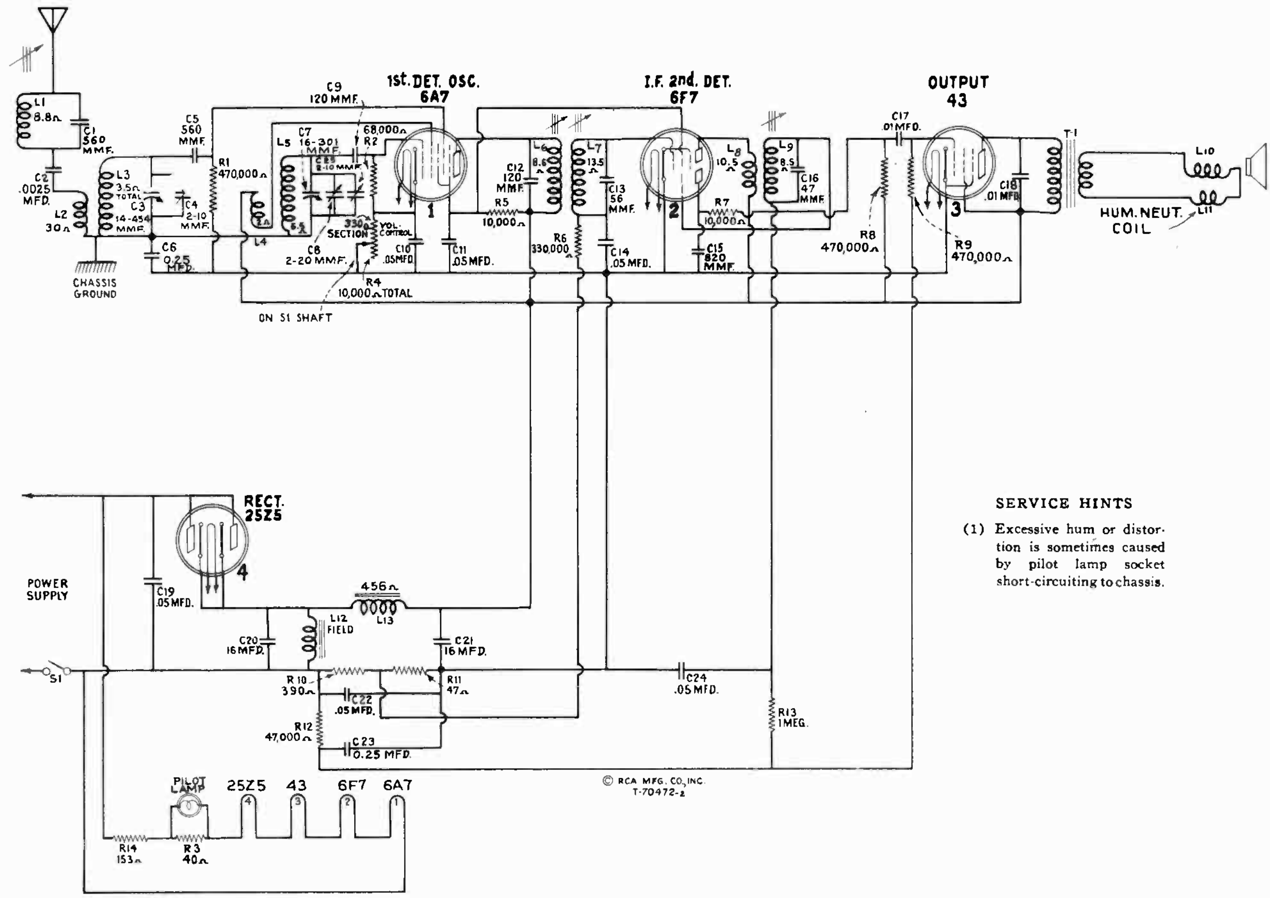
Circuit Arrangement

The conventional superheterodyne type of circuit, consisting of a combined first-detector–oscillator stage, a combined i-f amplifier and second detector stage, an audio power-output stage, and a half-wave rectifier stage, is used.

Tuned Circuits

The antenna and oscillator coils are tuned by a variable two-section gang condenser having trimming capacitors in shunt with each section. A wave-trap is employed and is connected in series with the antenna to reduce undesirable signals in the range of the i-f amplifier. It is tuned to 460 kc by means of a screw attached to the molded magnetite core.

The intermediate-frequency amplifier system consists of the pentode section of the RCA-6F7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Adjustable mangetite cores are provided for adjusting the inductance of



SERVICE HINTS

(1) Excessive hum or distortion is sometimes caused by pilot lamp socket short-circuiting to chassis.

Figure 1—Schematic Circuit Diagram

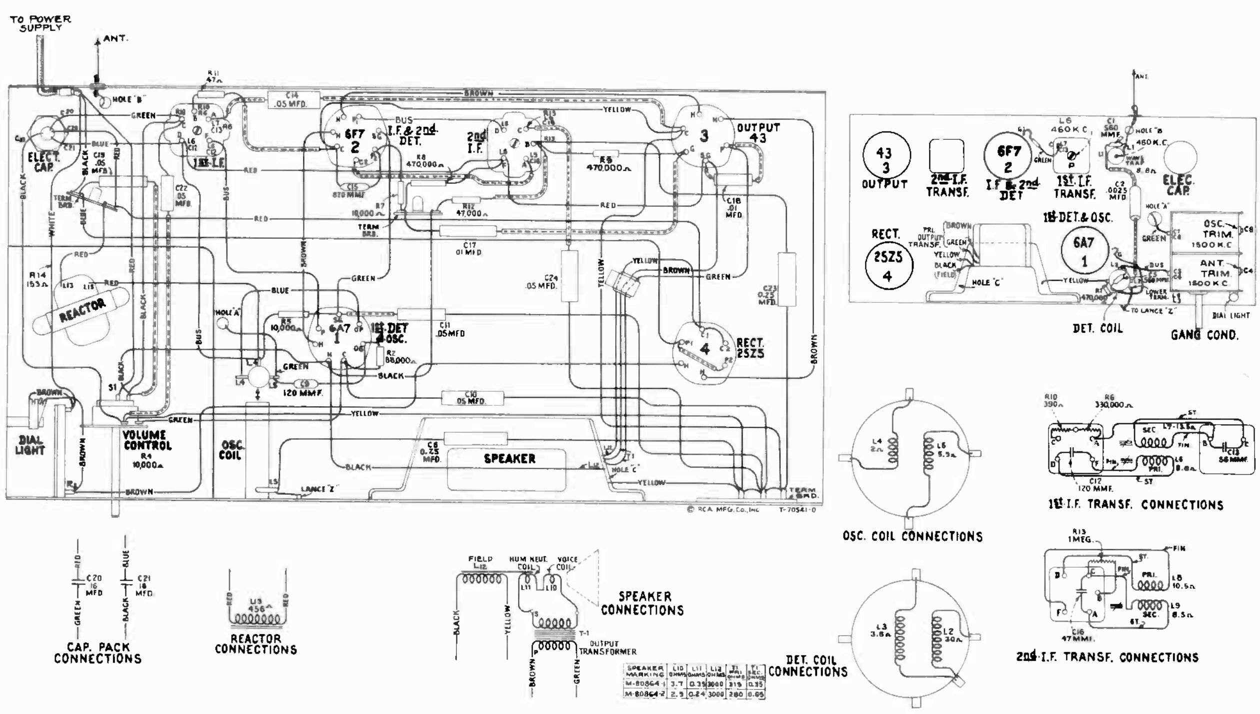


Figure 2—Chassis Wiring Diagram, Radiotron, Coil, and Trimmer Locations

the first i-f transformer primary and secondary, and the second i-f transformer secondary windings to 460 kc.

Second Detector and Audio System

The second-detector circuit uses the triode-portion of the RCA-6F7 in a conventional three-element power-detector circuit. The output of this stage is resistance-capacitance coupled to an RCA-43 power-output tube which, in turn, is transformer-coupled to the dynamic speaker.

Rectifier

The plate, grid, cathode, and the loudspeaker field voltages required for the operation of this receiver are supplied by the RCA-25Z5 tube operating as a half-wave rectifier.

SERVICE DATA

Alignment Procedure

There are two alignment trimmers provided in the antenna-coil and oscillator-coil tuned circuits. The i-f transformer adjustments are made by means of three screws attached to molded magnetite cores. The wave-trap is likewise adjusted by a screw attached to its molded core. Re-adjustment may occasionally occur from continued extremes of climate, tampering, purported alteration for services, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as the **RCA Stock No. 9595,** will be required as the source of the signal at the specified alignment frequencies. Visual indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Output Indicator** is especially suitable for this use.

The procedure outlined below should be followed in adjusting the various trimming capacitors and molded magnetite cores:

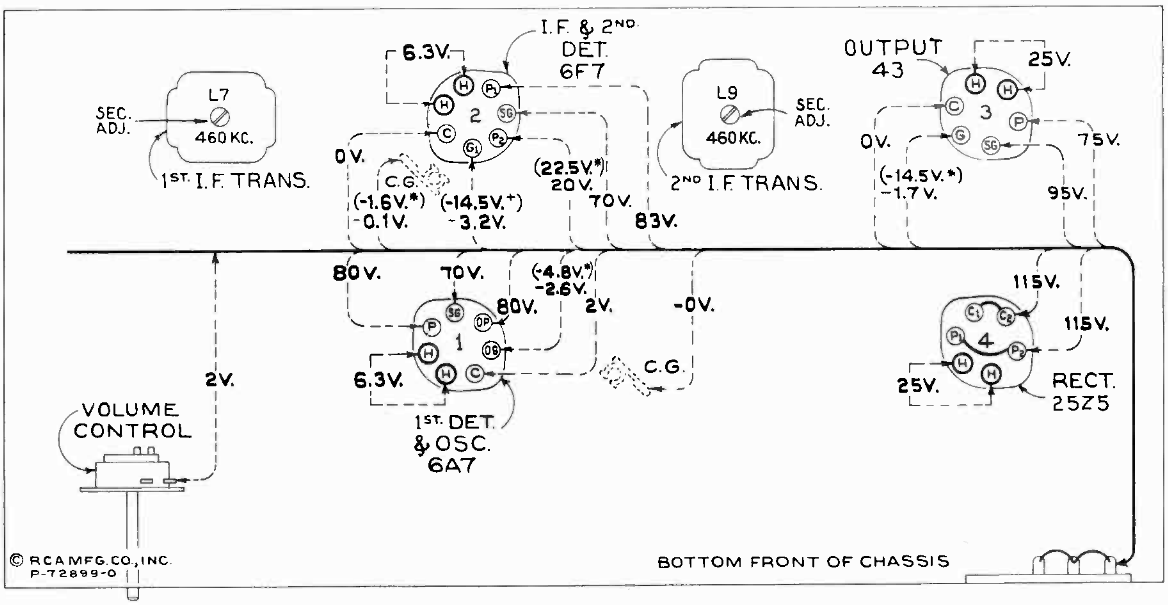


Figure 4—Radiotron Socket Voltages and Trimmer Locations

Measured at 115 volts, 60-cycle supply—For 115-volt d-c supply approximately 10% lower
Tuned to approximately 550 kc—No signal being received—
Volume control maximum

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground, on figure 4, will assist in locating cause for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 550 kc, no signal being received, and volume control set to maximum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Use nearest range above voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

I-F Core Adjustments

The three adjustment screws (one on top and one on bottom of first i-f transformer and one on bottom of second i-f transformer) are located as shown by figures 2 and 4. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil. Connect the output of the test oscillator through a **.05-mfd.** capacitor to the RCA-6A7 control grid, the ground of the test oscillator being connected to the receiver chassis. Set the test oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator.

Adjust the bottom core screw of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the two core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device.

It is advisable to repeat the adjustment of all i-f core screws to assure that the inter-action between them has not disturbed the original adjustment.

Wave-Trap Adjustment

Attach the output of the test oscillator to the "Antenna terminal" (see wave-trap, top view chassis, figure 2) through an **80-mmfd.** capacitor, the ground connection of the test oscillator and receiver chassis being connected as before. **Receiver "Antenna wire" should be reeled up for this and the following r-f adjustments.**

Leave the test oscillator adjusted to 460 **kc** as before. Then adjust the wave-trap trimmer to the point which causes **maximum suppression** of the 460 **kc** signal.

R-F Trimmer Adjustments

Since the dial is mounted on the cabinet, it will be necessary to perform the operations, in sequence, as follows:

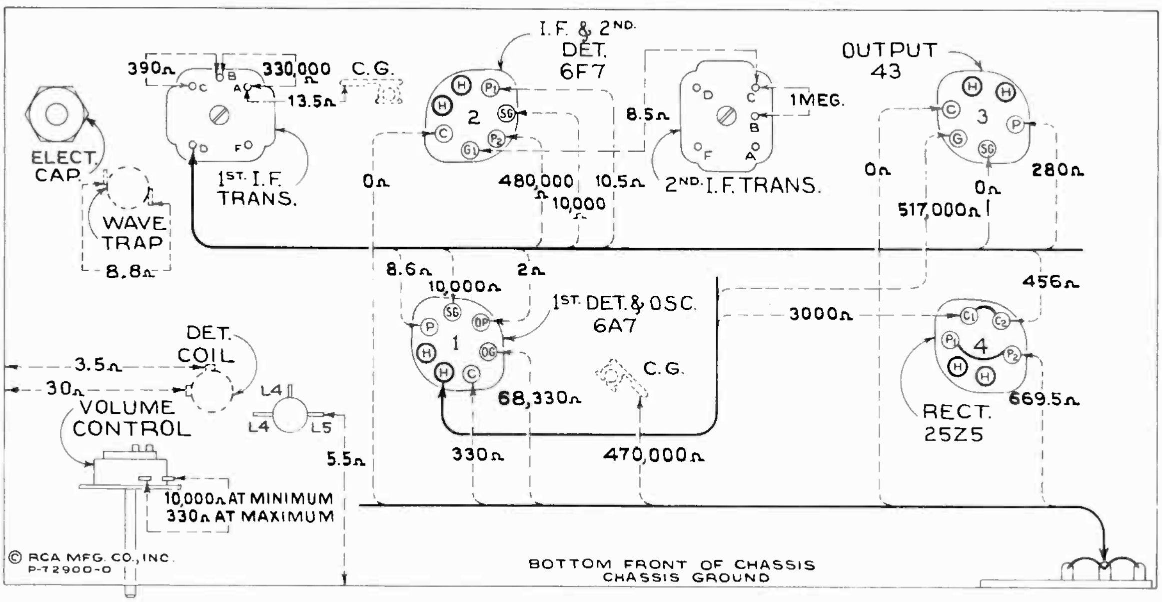


Figure 3—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh
Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 3, have been carefully selected so as to facilitate a rapid check of the circuit for defective parts, bad joints, etc. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and the Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which would otherwise be difficult to ascertain. Each value as specified should hold within $\pm 20\%$. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. Resistance values were measured with the Radiotrons in sockets, power supply disconnected, tuning condenser in full-mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative (−) terminal of the resistance meter to the chassis ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

Place the receiver in its cabinet. Set the gang tuning condenser to its maximum capacity (full-mesh) position and place the tuning knob on the gang tuning condenser shaft. Tighten the knob set screw with the dial pointer set to the low-frequency calibration line beyond **550 kc** (beyond "55" on the dial). Turn the tuning knob until the dial pointer indicates **1,500 kc.** Remove the tuning knob from shaft and receiver from cabinet, being careful not to disturb the setting of the gang condenser.

With the test oscillator and output indicator connected as specified under "Wave-trap adjustment" and receiver volume control in its maximum position, tune the test oscillator to **1,500 kc** and regulate its output to produce a suitable indication on the output indicator. Adjust the oscillator and antenna trimmers **C8** and **C4** for maximum (peak) output.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12118	Cap—Grid contact cap—Package of 5	.15
12405	Capacitor—47 Mmfd. (C16)	.26
12629	Capacitor—56 Mmfd. (C13)	.20
12404	Capacitor—120 Mmfd. (C12)	.26
12724	Capacitor—120 Mmfd. (C9)	.28
12537	Capacitor—560 Mmfd. (C1, C5)	.20
12536	Capacitor—820 Mmfd. (C15)	.25
5107	Capacitor—.0025 Mfd. (C2)	.16
4858	Capacitor—.01 Mfd. (C17, C18)	.25
4836	Capacitor—.05 Mfd. (C10, C11, C14, C22, C24)	.30
4886	Capacitor—.05 Mfd. (C19)	.20
4840	Capacitor—0.25 Mfd. (C23)	.30
12484	Capacitor—0.25 Mfd. (C6)	.24
12844	Capacitor—Pack comprising 2 sections each 16 Mfd. (C20, C21)	2.55
12837	Coil—Antenna coil (L2, L3)	1.50
12838	Coil—Oscillator coil (L4, L5)	.85
12842	Condenser—2-gang variable tuning condenser (C3, C4, C7, C8)	2.30
12847	Cord—Power cord, 153 ohm resistance (R14)	.95
12006	Core—Adjustable core and stud for Stock No. 12497, 12839 and 12840	.22
4340	Lamp—Dial lamp, 6.3 volt—Package of 5	.60
12409	Lead—Antenna lead approximately 20 feet long	.35
12843	Reactor—Iron core reactor (L13)	1.00
12848	Resistor—47 ohm—insulated—1/4 watt—Package of 5 (R11)	1.00
12841	Resistor—390 ohm—carbon type—1/10 watt—Package of 5 (R10)	.75
12265	Resistor—10,000 ohm—insulated—1/4 watt—Package of 5 (R5, R7)	1.00
12412	Resistor—47,000 ohm—insulated—1/4 watt—Package of 5 (R12)	1.00
12696	Resistor—68,000 ohm—insulated—1/4 watt—Package of 5 (R2)	1.00
11297	Resistor—330,000 ohm—carbon type—1/10 watt—Package of 5 (R6)	.75
11452	Resistor—470,000 ohm—carbon type—1/10 watt—Package of 5 (R1)	.75
12285	Resistor—470,000 ohm—insulated—1/4 watt—Package of 5 (R8, R9)	1.00
12013	Resistor—1 meg—carbon type—1/10 watt—Package of 5 (R13)	.75
12845	Resistor—Wire wound 40 ohms (R3)	.40
12008	Shield—I.F. transformer shield for Stock No. 12839	.28
12408	Shield—I.F. transformer shield for Stock No. 12840	.28
12218	Shield—Radiotron shield	.15
12607	Shield—Shield top for Stock No. 12839	.30
12007	Spring—Retaining spring of core Stock No. 12006—Package of 10	.36
4786	Socket—6-contact 43 or 25Z5 radiotron socket	.15
4787	Socket—7-contact 6A7 or 6F7 radiotron socket	.15
12846	Socket—Dial lamp socket	.25
12839	Transformer—First I.F. transformer complete (L6, L7, C12, C13, R6, R10)	2.30
12840	Transformer—Second I.F. transformer complete (L8, L9, C16, R13)	1.50
12497	Trap—Wave trap (L1)	.70
12836	Volume Control and power switch (R4, S1)	1.10
	REPRODUCER ASSEMBLIES (M80864-1)	
12499	Coil—Field coil (L12)	1.60
12731	Coil—Neutralizing coil (L11)	.22
12498	Cone—Reproducer cone and dust cap (L10)	1.20
9684	Reproducer Complete	2.25
12500	Transformer—Output transformer (T1)	1.60
	REPRODUCER ASSEMBLIES (M80864-2)	
13149	Coil—Reproducer field and neutralizing coil (L11, L12)	1.60
13148	Cone—Reproducer cone complete (L10)	1.25
9750	Reproducer—Speaker complete	5.50
13151	Transformer—Output transformer (T1)	1.60
	MISCELLANEOUS ASSEMBLIES	
12834	Dial—Station selector dial scale (4X and 4X3)	.50
12935	Dial—Station selector dial scale (Used on 4X4 only)	.55
12833	Knob—Station selector knob—Package of 5 (4X and 4X3)	.50
12934	Knob—Station selector knob—Package of 5 (4X4 only)	.45
12933	Knob—Volume control knob—Package of 5 (4X4 only)	.45
12673	Knob—Volume control knob—Package of 5 (4X and 4X3)	.58
12835	Screw—Chassis mounting screw and washers—Package of 10	.30
4119	Screw—Set screw for knob Stock No. 12673, 12833, 12933 and 12934—Package of 20	.38

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 5BT

Five-Tube, Single-Band, Battery-Operated, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGE .... 530-1,800 kc

ALIGNMENT FREQUENCIES
600 kc (osc.), 1,500 kc (osc., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-1A6 .... First Detector—Oscillator
(2) RCA-1A4 .... Intermediate Amplifier
(3) RCA-1F6 ... Second Detector—A. F.—A.V.C.
(4) RCA-30 .... Audio Driver
(5) RCA-19 .... Power Output

Pilot Lamp (1) .... Mazda 2.0 volts, .06 ampere, miniature screw base

BATTERIES REQUIRED

"A," one plug-in 2½-volt Air-cell (heavy duty), or one 2-volt storage battery; "B," three 45-volt B batteries (heavy duty); "C" one 7½-volt C battery and two bias cells (Stock No. 12681)

CURRENT CONSUMPTION
"A" at 2 volts .... 0.54 amp.
"B" at 135 volts .... 18 ma.
Fuse Rating .... ½ ampere

POWER OUTPUT (135 volts "B" Battery)
Undistorted .... 1.3 watts
Maximum .... 2.2 watts

LOUDSPEAKER (Permanent-Magnet Dynamic) .... Impedance (V. C.) 2.2 ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS
Height .... 17⅞ inches
Width .... 13⅜ inches
Depth .... 8 inches

WEIGHTS
Net .... 19 pounds
Shipping .... 23 pounds
Chassis Base Dimensions .... 12 inches x 7 inches x 2⅞ inches
Over-all Height of Chassis .... 7¼ inches
Operating Controls .... (1) Power Switch-Volume, (2) Tuning

Tuning Drive Ratios .... 5 to 1

General Features

This model contains a five-tube chassis, battery operated, mounted in a table-type cabinet. The superheterodyne circuit is used, incorporating such features of design as automatic volume control, magnetite core adjusted i-f transformers, diode detection, improved dust-proof permanent-magnet dynamic speaker, and phonograph terminal board. The frequency range extends from 530 to 1,800 kc which covers the regular broadcast band and includes police calls in the 1,600 to 1,800 kc portion of the range.

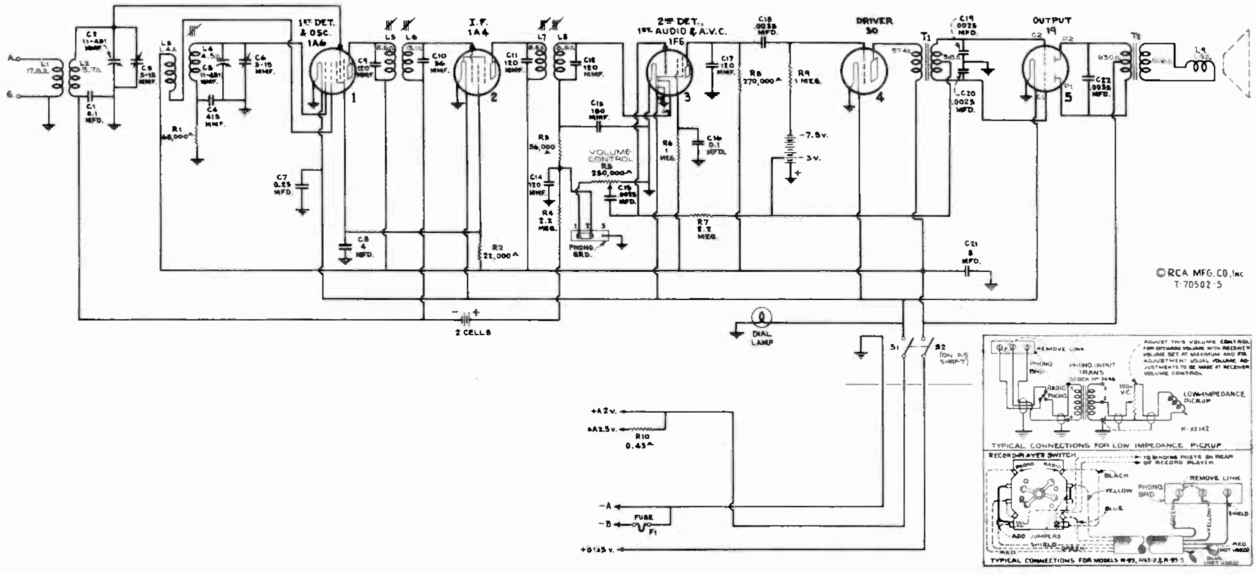


Figure 1—Schematic Circuit Diagram

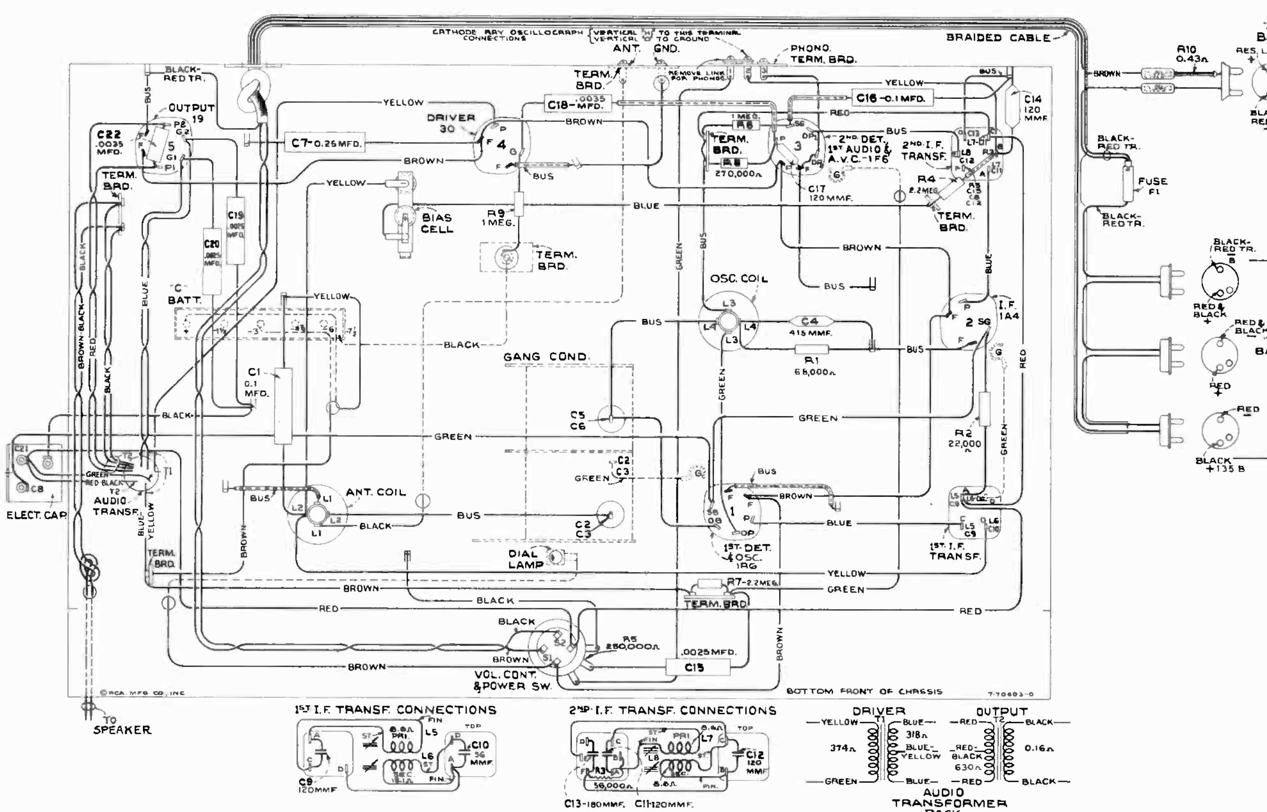


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The first-detector and oscillator functions are combined in the RCA-1A6 tube. The input of this tube is coupled to the antenna through a tuned r-f transformer.

The intermediate-frequency stage is coupled to the RCA-1A6 and to the RCA-1F6 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by one of the diode plates of the RCA-1F6. The audio component of this rectified signal, which develops across the volume control R5, is fed through coupling capacitor C15 to the control grid of this same RCA-1F6 for audio voltage amplification. The d-c component resulting from the detection is fed through resistance-capacitance filters to the control grid returns of the RCA-1A6 and RCA-1A4 tubes as automatic volume control voltage. Bias cells are connected in these grid circuits to provide minimum bias voltage under conditions of little or no signal. The output of the RCA-1F6 is resistance-capacitance coupled to the RCA-30 driver. The driver is transformer-coupled to the RCA-19 tube used in the output stage. The output of this push-pull stage is transformer-coupled to the permanent-magnet dynamic loudspeaker.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to isolate causes of defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1, etc.,

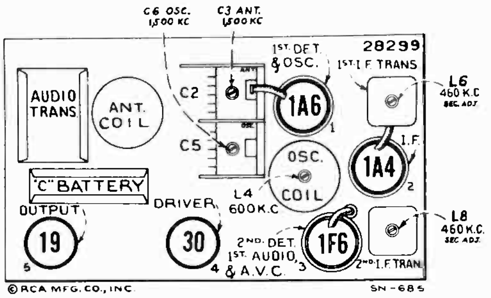


Figure 3—Radiotron, Coil, and Trimmer Locations

are provided for reference between the illustrations and the Replacement Parts List. The coils and transformer windings are rated in terms of their d-c resistance only. Ratings of less than one ohm are generally omitted.

Caution: The two bias cells are used only for the purpose of supplying bias potential and should never be measured with an ordinary voltmeter or other device which draws any current. A simple check on these cells may be made by connecting a milliammeter in the plate circuit of the RCA-1A4 tube and noting the plate current reading. Then remove the two bias cells, being careful that the spring contact clips do not short-circuit them during removal. Connnect a 2-volt battery between the + and — 2v. (— battery to grid side) terminals of the bias cell board, and again note the plate current reading. If the first reading obtained (with bias cells) is more than 40% from the latter reading (with 2-volt battery), the bias cells should be replaced. This 40% difference is equivalent to a change of approximately 25% battery voltage.

Alignment Procedure

The circuits of this receiver have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595**, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustments is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 6. Each circuit must be aligned to a basic frequency of **460 kc.**

Connect the "Ant." output of the test-oscillator to the control grid of the RCA-1A6 through a **.001 mfd.** capacitor. Connect the test oscillator "Gnd." terminal to the ground terminal of the receiver chassis. Tune the test oscillator to **460 kc.** Adjust the receiver tuning control to a point, within its range, where no interference is encountered either from broadcast stations or short stator of oscillator tuning condenser C5 to ground, eliminating local (hetrodyne) oscillator signals.

Adjust the two magnetite core screws **L8** and **L7** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws **L6** and **L5** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments. Remove temporary jumper, stator C5 to ground, if used.

R-F Adjustments

Calibrate the tuning dial by adjusting the dial pointer to the extreme low-frequency end calibration mark **(530 kc)** on dial scale while the gang tuning condenser plates are in their full-mesh position. Reduce output of test oscillator to minimum. Set receiver dial pointer to **600 kc.** Tune the test oscillator to 600 **kc** and increase its output until an indication is obtained on the output indicator.

Adjust oscillator magnetite core screw **L4** (top of oscillator coil) so that maximum (peak) indication is shown by the output indicator.

Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc.** Adjust the oscillator and antenna trimmers **C6** and **C3** for maximum (peak) indicated output.

Tune test oscillator to **600 kc** and adjust receiver to pick up this signal **near 600 kc.** Readjust the oscillator magnetite core screw **L4** for maximum (peak) indicated output while rocking the receiver gang tuning condenser back and forth through this signal.

Repeat adjustments of **C6** and **C3** as above to correct for any changes in the oscillator tuning caused by the adjustment of **L4.**

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow

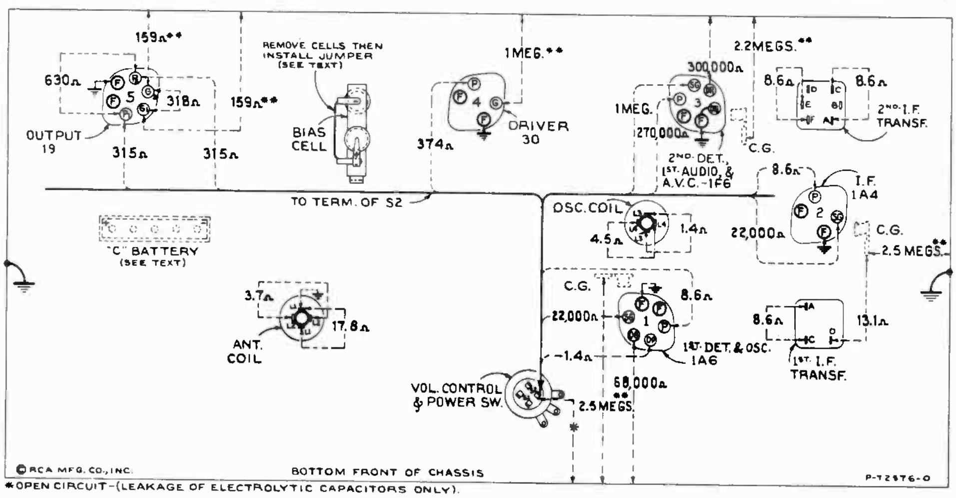


Figure 4—Resistance Diagram

Battery-supply cable disconnected—Radiotrons removed—Tuning condenser in full-mesh—Bias cells and "C" battery removed—Volume setting optional

Resistance Measurements

Before making any resistance measurements, remove the two bias cells and connect jumpers on bias-cell board as shown. Also, remove the "C" battery and connect the two leads (—7½ v. and —3 v.) to chassis ground. After measurements are completed, remove jumpers from bias-cell board and then carefully insert bias cells. Next, insert "C" battery and restore leads to their respective positions.

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

the acetone to flow down into the air gap. The dust cover should be cemeted back in place with ambroid upon completion of adjustment.

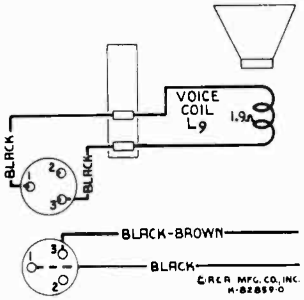


Figure 5—Loudspeaker Wiring

as shown on figure 2. When operating on a 2-volt storage battery, this resistor R10 should be removed. Plugs are provided on the battery cable (see figure 2) for plugging in the Air-cell and B batteries. The A-battery plug should be removed when operating

Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube Socket Plate Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-1A6—1st. Det.	2.26	ma.
	—Osc.	1.86	ma.
(2)	RCA-1A4—I.F.	3.6	ma.
(3)	RCA-1F6—2nd Det.—A.F.—A.V.C.	0.3	ma.
(4)	RCA-30—Driver	3.8	ma.
(5)	RCA-49—Output	2.8	ma.**

(** Total plate current.)

Power Supply

Filament voltage for this receiver is obtained from either a $2\frac{1}{2}$-volt Air-cell or a 2-volt storage battery. When the Air-cell is used, the 0.43 ohm resistor R10 must be connected in series with the A-battery lead on a 2-volt storage battery. The $7\frac{1}{2}$-volt C battery is located on the top-side of the chassis and securely held in place by a metal cover (see figure 3). The two bias cells are located underneath the chassis (see figures 2 and 5).

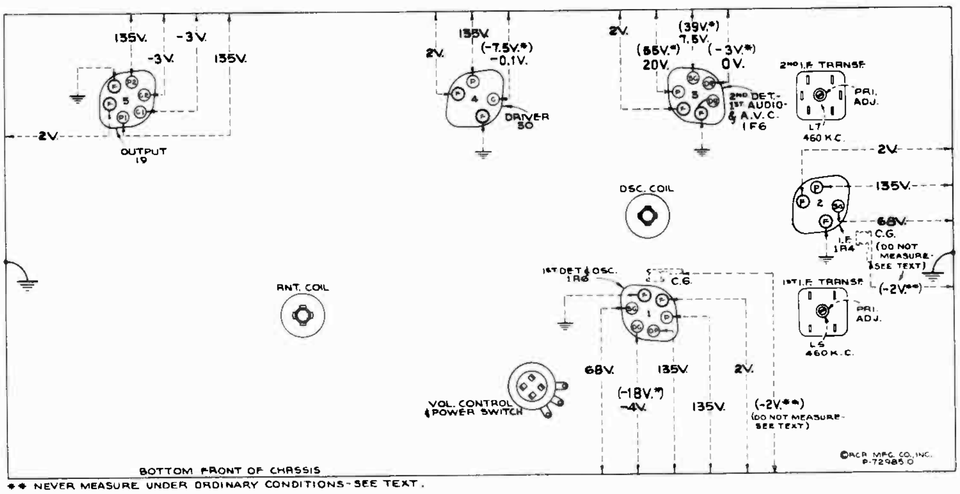


Figure 6—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured with all batteries at normal voltage—Tuned to approximately 1,000 kc—No signal being received—Volume control optional

Radiotron Socket Voltages

***CAUTION:** Do not attempt to measure voltages on control grids of RCA-1A6 or RCA-1A4, with any conventional voltmeter, due to presence of bias cells. See "Caution" under "Service data" for method of measuring these cells.*

***Note:** Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 6 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Use the nearest range above the voltage to be measured.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
13216	Board—Antenna and ground terminal board	$0.25
12717	Board—Phonograph terminal board	.22
4289	Body—Female section of fuse holder—Package of 10	.35
4286	Bushing—Bushing and ferrule assembly for fuse holder—Package of 10	.38
13217	Cable—Battery cable complete with four 2-contact male connectors, fuse holder and fuse	3.05
4288	Cap—Male section of fuse holder—Package of 10	.36
12629	Capacitor—56 Mmfd. (C10)	.20
12404	Capacitor—120 Mmfd. (C9, C11, C12)	.26
12724	Capacitor—120 Mmfd. (C14, C17)	.28
12406	Capacitor—180 Mmfd. (C13)	.26
13297	Capacitor—415 Mmfd. (C4)	.25
5107	Capacitor—.0025 Mfd. (C15, C19, C20)	.16
5005	Capacitor—.0035 Mfd. (C18, C22)	.16
4841	Capacitor—0.1 Mfd. (C1, C16)	.22
4840	Capacitor—0.25 Mfd. (C7)	.30
13295	Capacitor Pack—Comprising one 4 mfd. and one 8 mfd. sections (C8, C21)	1.70
13293	Coil—Antenna coil with shield (L1, L2)	1.00
13294	Coil—Oscillator coil with shield (L3, L4)	1.00
13212	Condenser—2-gang variable tuning condenser (C2, C3, C5, C6)	3.40
12828	Connector—2-contact male connector for cable, Stock No. 13217	.20
12827	Connector—2-contact and guide pin male connector for cable Stock No. 13217	.30
5119	Connector—3-contact female connector for speaker cable	.25
12006	Core—Adjustable core and stud assembly for Stock Nos. 12801 and 12802	.22
12681	Cell—Bias cell	.30
13391	Dial—Station selector dial scale	.45
3748	Fuse—½ ampere—Package of 5 (F1)	.40
13215	Holder—Bias cell holder	.25
13213	Indicator—Station selector indicator pointer	.15
4290	Insulator—Insulator for female section of fuse holders—Package of 10	.35
4348	Lamp—Dial lamp	.38
13298	Resistor—Flexible type, 0.43 ohm—Package of 5 (R10)	.90
11305	Resistor—22,000 ohms, carbon type, ¼ watt—Package of 5 (R2)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R3)	.75
12009	Resistor—68,000 ohms, carbon type, ¼ watt—Package of 5 (R1)	$1.00
11323	Resistor—270,000 ohms, carbon type, ¼ watt—Package of 5 (R8)	1.00
12200	Resistor—1 meg., insulated, ¼ watt—Package of 5 (R6, R9)	1.00
11626	Resistor—2.2 meg., carbon type, ¼ watt—Package of 5 (R4, R7)	1.00
13296	Shield—Coil shield for coil Stock Nos. 13293 and 13294	.30
12008	Shield—First or second I. F. transformer shield	.28
12607	Shield—First I. F. transformer shield top	.30
12581	Shield—Second I. F. transformer shield top	.36
3682	Shield—1A4, 1A6, or 1F6 Radiotron shield	.22
8098	Socket—Dial lamp socket	.10
4794	Socket—4-contact 1A4 or 30 Radiotron socket	.15
4786	Socket—6-contact 1A6, 1F6 or 19 Radiotron socket	.15
12007	Spring—Retaining spring for core, Stock No. 12006—Package of 10	.36
4284	Spring—Spring for female section fuse holder—Package of 10	.30
12803	Transformer—Audio transformer pack (T1, T2)	3.55
12801	Transformer—First I. F. transformer (L5, L6, C9, C10)	1.70
12802	Transformer—Second I. F. transformer (L7, L8, C11, C12, C13, R3)	1.85
13214	Volume control and power switch (R5, S1, S2)	1.50
4285	Washer—Insulating washer for female section of fuse holder—Package of 10	.22
	REPRODUCER ASSEMBLIES	
12642	Cone—Reproducer cone and dust cap	.94
5118	Plug—3-contact male connector for reproducer	.25
9712	Reproducer—Complete	6.60
	MISCELLANEOUS ASSEMBLIES	
12638	Knob—Station selector control knob—Package of 5	.58
11347	Knob—Volume control knob—Package of 5	.75
11377	Screw—Chassis mounting screw assembly—Package of 4	.12
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12638—Package of 5	.25

Prices quoted above are subject to change without notice.

First Edition.

RCA VICTOR MODEL 5M

Five-Tube, Superheterodyne Automobile Receiver

Technical Information

Electrical Specifications

RADIOTRON COMPLEMENT

(1) RCA-6D6..........Radio Frequency Amplifier
(2) RCA-6A8............First Detector–Oscillator
(3) RCA-6K7..............Intermediate Amplifier
(4) RCA-6B7..Second Det., A-F Amp., and A.V.C.
(5) RCA-42......................Power Output

Tuning Range ....540 to 1,600 kc.

OUTPUT RATING

Maximum ....4 Watts
Undistorted ....2.25 Watts

LOUDSPEAKER

Type ....Electrodynamic
Impedance (V. C.)..........3 Ohms at 400 Cycles

POWER RATING

Supply Voltage ....6.3 Volts (Storage Battery)
Current Drain ....6.5 Amperes at 6.3 Volts
Fuse Protection ....15 Amperes
Pilot Lamp ....Mazda No. 44, 6.3 Volts

ALIGNMENT FREQUENCIES

I. F. Transformers ....260 kc.
Oscillator Coil ....600 kc. and 1,400 kc.
Detector Coil ....1,400 kc.
Antenna Coil ....1,400 kc.

Mechanical Specifications

RECEIVER CASE DIMENSIONS

Height ....7 Inches   Width ....$10\frac{1}{16}$ Inches   Depth ....$7\frac{1}{8}$ Inches

OPERATING CONTROLS ....(1) Power Switch–Volume, (2) Tuning, (3) High-Frequency Tone
TUNING DRIVE RATIO 12-to-1

WEIGHT

Receiver and Accessories Complete ....$23\frac{1}{2}$ pounds
Complete Equipment Packed for Shipment ....26 pounds

General Description

Model 5M is a single-unit receiver containing the radio chassis, power conversion system, and loudspeaker all in one housing. A convenient three-contact loudspeaker receptacle installed on the chassis case permits the addition of a remote dynamic loudspeaker if desired.

Engineering features incorporated in this instrument are: The inclusion of ignition suppression means within the circuits of the receiver; reduction of power line modulation in antenna circuit; improved high-gain molded core antenna coil; permeability tuned intermediate frequency transformers; continuously variable high-frequency tone control; and a "plug-in type of synchronous rectifier-vibrator for obtaining high-voltage supply. Correct arrangement of parts, adequate shielding, and the ingenious insertion of filters at proper points in the circuit insure minimum disturbances from apparatus associated with the electrical circuits of the automobile and from adjacent power lines.

This receiver is housed in a substantial metal case. Removable covers permit ready access to the under and top sides of the chassis. Flexible shafts interconnect the operating head to the controlled devices within the receiver housing. The unit is adaptable for mounting on either the left-hand or the right-hand side of the firewall as local conditions demand.

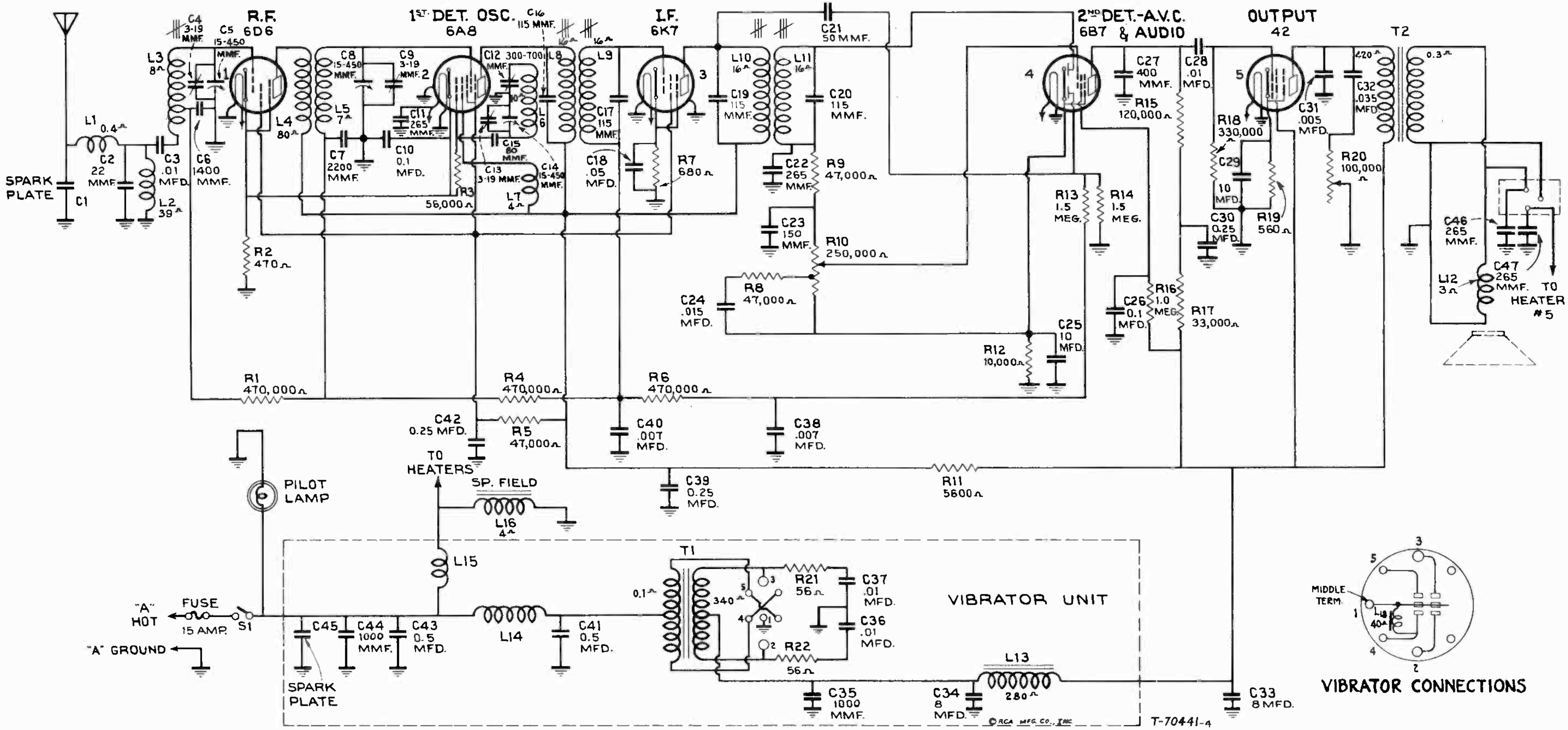


Figure 1—Schematic Circuit Diagram

Certain automobile installations require change of value of capacitor C-3. See note in text under "Service Data."

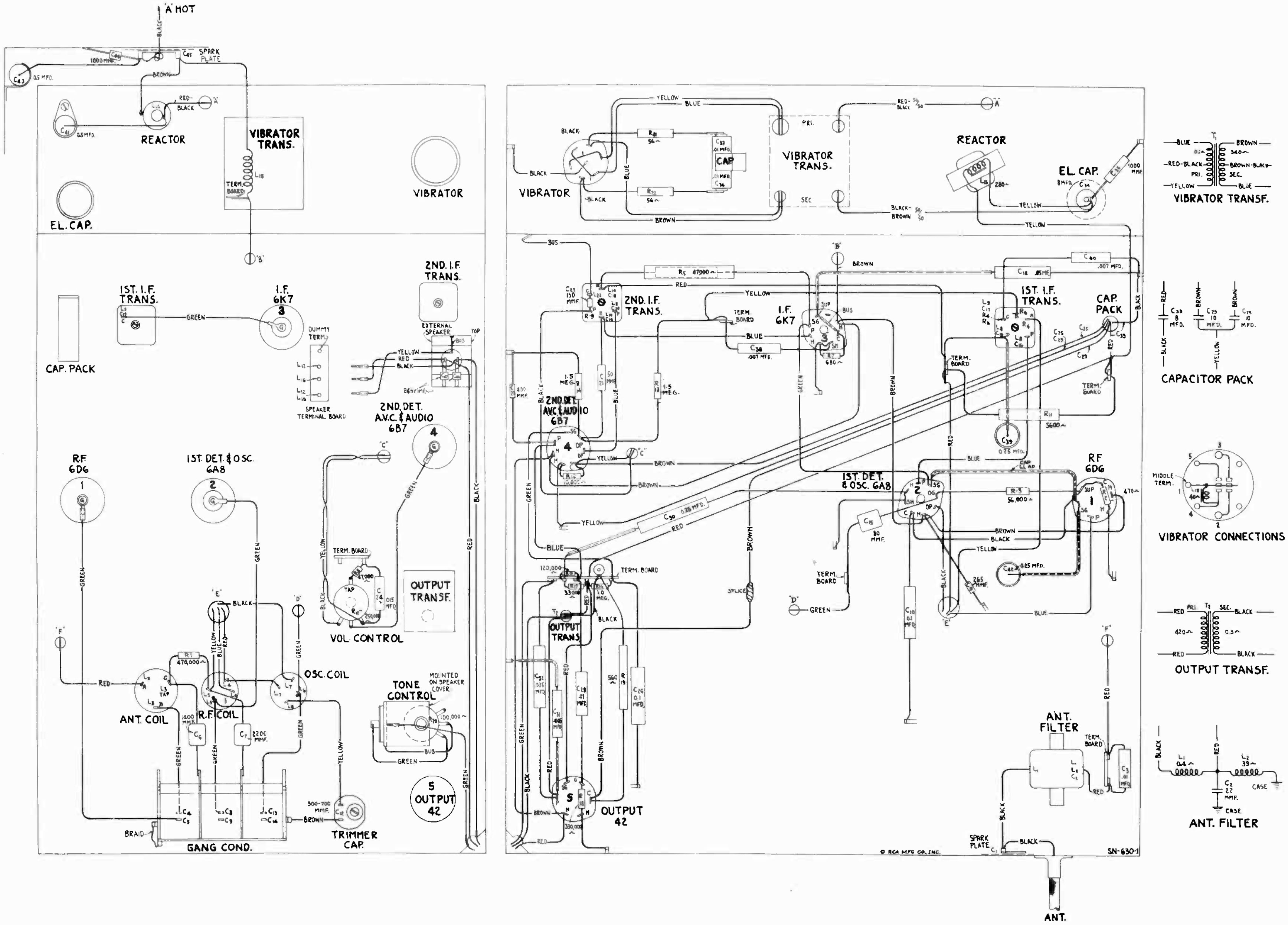


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The schematic and wiring layouts of the electrical circuit are shown in Figures 1 and 2, respectively. From these diagrams it may be seen that five Radiotrons are incorporated in the basic superheterodyne circuit. In sequence, there is an r-f stage, a dual first-detector–oscillator stage, a single i-f stage, a second-detector–audio-amplifier–a.v.c. stage, and a pentode power output stage. The power supply system contains a mechanical interrupter and rectifier. The following circuit features are of particular importance:

Noise Filter—Reduction of ignition interference and similar disturbances are brought about by filter arrangements in the antenna input circuit and the "A" battery input lead. This antenna filter, L-1, C-1, and C-2, is a "low-pass" type, having an acceptance band below 1,600 kc. The inductance L-2 is for the purpose of shunting out power line hum pickup.

Tuned Circuits—There are seven resonant circuits in the radio frequency end of the receiver. The r-f, first-detector, and oscillator grid circuits are tuned by a three-gang tuning condenser. The remaining tuned circuits consist of the primary and secondary windings of the i-f transformers which resonate with fixed condensers and are tuned by molded cores to a nominal frequency of 260 kilocycles.

Detection—Detection takes place as the result of the rectifying action of one of the diodes of the RCA-6B7 tube, the current being developed through resistors R-9 and R-10. The audio and d-c components of the detected signal are selected from the manual volume control resistor (R-10) by its movable arm, and applied to the control grid of the RCA-6B7; amplification results and the signal passes on to the power output stage. The d-c applied to the grid prevents overload as the volume control is advanced.

A.V.C.—The a.v.c. diode of the RCA-6B7 tube is coupled through capacitor C-21 to the primary of the second i-f transformer. Due to the rectifying action of this diode, a current is developed through resistor R-14. The d-c voltage drop in this resistor is used for automatically regulating the control grid bias of the r-f, first detector, and i-f stages, the voltage being applied through a suitable filter network. Due to the fact that the a.v.c. diode returns through resistor R-14 to a point which is 12 volts negative with respect to its cathode, the a.v.c. action is delayed until the input signal reaches a predetermined level. This gives more uniform output for widely varying signal strengths into the antenna.

Audio System—As mentioned under "Detection" the audio component of the detected signal is selected from the manual volume control and applied to the control grid of the RCA-6B7 tube. The plate circuit of this tube is connected through capacitor C-28 to the control grid of the pentode power output tube, RCA-42. This tube is coupled through the output transformer T-2 to the loudspeaker.

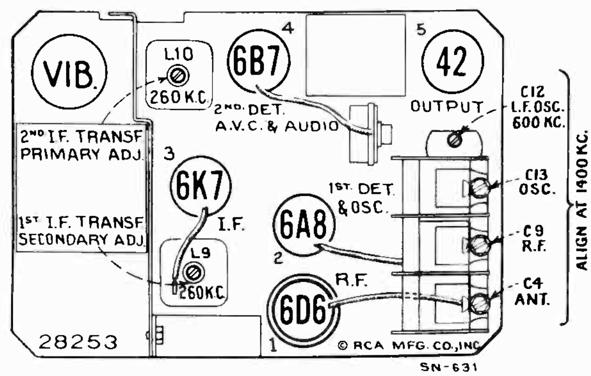


Figure 3—Radiotron, Coil, and Trimmer Locations

SERVICE DATA

NOTE: Certain models of 1936 automobiles are equipped with **"high-capacitance type"** *(400* **mmfd.** *or greater) built-in antennas. The 1936 models of Dodge, De Soto, and Chrysler are examples of automobiles so equipped. Installation of receiver in automobiles with such* **"high-capacity"** *antennas necessitates the following modification of the antenna circuit of the receiver to suit the characteristics of the antenna installation:*

Remove the tubular paper-covered capacitor **C-3** *(***.01 mfd.***), Figure 2, and replace with the small molded type capacitor (***500 mmfd.***) furnished with Escutcheon Kit for respective model of automobile.*

The various diagrams of this booklet contain such information as will be needed to locate causes for defective operation when such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are four alignment trimmers provided in the antenna, coil, detector coil, and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of four screws attached to molded cores.

NOTE: The antenna coil has a molded core which is adjusted at the factory for the correct inductance. **This adjustment should not be disturbed.**

All of the adjustable circuits of this receiver have been properly aligned at the factory to give correct performance and their settings should remain intact indefinitely when the receiver is used under ordinary conditions. However, necessity for re-adjustment may occasionally occur from continued extremes of climate, tampering, purported alteration for service purposes, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the receiver to be insensitive, non-selective, and subnormal in respect to tone quality. Such indications will usually exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as the RCA Stock No. 9595, will be required as the source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. Two indication methods are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave image which represents the resonance characteristics of the circuits being tuned. This type of alignment is possible through use of apparatus such as the RCA Stock No. 9558 Frequency Modulator and the RCA Stock No. 9545 Cathode-Ray Oscillograph. Alignment by the output meter method should be indicated by an instrument such as the RCA Stock No. 4317 Neon Glow Indicator. The two procedures are outlined as follows:

CATHODE-RAY ALIGNMENT

Attach the cathode-ray oscillograph vertical input terminals to the second detector output, with the "Hi" connected to the junction of the two resistors, R-9 and R-10, and the "0" connected to the receiver chassis. Advance the vertical amplifier gain control of the oscillograph to full-on, allowing it to remain at such position for all adjustments. Turn the vertical "A" amplifier to "On." Set the oscillograph power switch to "On" and adjust the intensity and focusing controls to give a sharply defined spot on the screen. Interconnect the frequency modulator impulse generator terminals to the oscillograph "Ext. Sync." terminals, as shown by Figure 4.

I-F Adjustments

(a) Connect the output of the test oscillator to the control grip cap of the i-f tube (RCA-6K7) through a 0.25 mfd. capacitor and connect the ground of the oscillator to the receiver chassis. Tune the oscillator to 260 kc., place its modulation switch to "On" and its output range switch to "Hi." The frequency modulator must not be connected to the oscillator for the preliminary adjustments.

(b) Set the cathode-ray oscillograph horizontal "B" amplifier to "Timing" and the synchronizing switch (timing) to "Int." Place the synchronizing input and frequency controls to about their mid-positions. Turn the range switch to its No. 1 position.

(c) Increase the output of the oscillator until a deflection is noticeable on the oscillograph screen. The figure obtained represents several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave image formed (400-cycle waves) to be spread completely across the screen by advancing the horizontal "B" gain control. The image should be synchronized and made to remain motionless by adjustment of the synchronizing input and frequency controls.

(d) Adjust the two screws (attached to molded cores) of the second i-f transformer, one on top and one on bottom, to produce maximum vertical deflection of the oscillographic wave which is present on the screen. This adjustment places the transformer in exact resonance with the 260 kc. signal.

(e) The sweeping operation should follow using the frequency modulator. Shift the oscillograph synchronizing switch to "Ext.", change its range switch to No. 2 position and set the frequency control to its mid-position. Place the

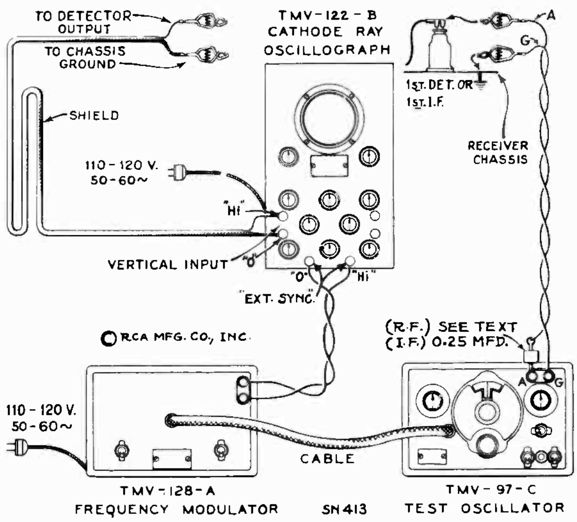


Figure 4—Alignment Apparatus Connections

frequency modulator in operation, with its sweep range switch in the "Lo" position. Interconnect the test oscillator and frequency modulator with the special shielded patch cord provided. Turn the oscillator modulation switch to "Off."

(f) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. These waves will be identical in shape, but will be totally disconnected and appearing in reversed positions. They will have a common base line which is discontinuous. Adjust the frequency and synchronizing input controls of the oscillograph to get the proper waves and to make them remain motionless on the screen. Continue increasing the oscillator frequency until the forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will obtain at an oscillator setting of approximately 360 kc.

(g) With the images established as in (f), re-adjust the two screws on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(h) Without altering the adjustments of the apparatus, shift the output connections of the oscillator to the input of the i-f system, i. e., between the first detector (RCA-6A8) control grid and ground. Regulate its output so that the amplitude of the oscillographic image is approximately the same as used above for adjustment (g) of the second i-f transformer.

(i) The two first i-f transformer adjustment screws, one on top and one on bottom, should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

NOTE: *Before making r-f adjustments, it may be advisable to replace the bottom cover to eliminate vibrator interference.*

(a) Adjust the dial pointer on the remote control head by the following procedure: Rotate tuning knob to its extreme clockwise position irrespective of location of pointer on dial. Now turn the pointer adjusting screw in the center of the back of the control unit until the pointer is at the end calibration mark beyond the **55** on dial scale.

(b) Attach the output of the test oscillator to the receiver input, i. e., between the antenna and ground terminals, with a **175 mmfd.** capacitor in series with antenna lead.

NOTE: *For r-f alignment of receivers in which the tubular paper condenser* **C-3** *(***.01 mfd.***) has been replaced by the small molded condenser,* **500 mmfd.** *(change easily identified by reference to Figure 2 and bottom of chassis), use a* **.001 mfd.** *capacitor instead of the* **175 mmfd.** *capacitor in series with the antenna lead and test oscillator.*

There shouuld be a shunt capacitor of **50** or **60 mmfd.** from the antenna lead at the receiver to ground. Accurately tune the oscillator to 1,400 kc. The oscillograph should be left connected to the second detector output circuit as for the above i-f adjustments. Return the synchronizing switch to its "Int." position and turn the range switch to its No. 1 position.

(c) Tune the receiver to a dial reading of 1,400 kc. Then regulate the oscillator output so as to increase the amplitude of the waves on the oscillograph screen to a conveniently observable size. The several waves of detected signal, as appearing on the screen, should be synchronized by operation of the synchronizing and frequency controls. Trimmers, C-13, C-9, and C-4, of the oscillator, detector, and antenna coils should then be adjusted so that each causes maximum vertical deflection (amplitude) of the images.

(d) The oscillator modulation should then be turned to "Off" and the frequency modulator placed in operation, connected to the oscillator with the shielded patch cord. Change the oscillograph synchronizing switch to "Ext.", set its range switch to its No. 2 position and the frequency control slightly above its mid-position.

(e) Increase the frequency of the test oscillator gradually, until the point is reached where the two similar, distinct, and separate wave images appear on the screen and become coincident at their highest points. This will occur at an oscillator setting of approximately 1,500 kc. These waves should be synchronized on the oscillograph screen by careful re-adjustment of the synchronizing and frequency controls. Re-adjust trimmers, C-13, C-9, and C-4, to produce complete coincidence at maximum amplitude of the two waves.

(f) Disconnect the frequency modulator from the oscillator. Place the modulation switch of the oscillator to "On" and tune the oscillator to 600 kc. Set the synchronizing switch of the oscillograph to "Int." and turn the range switch to No. 1 position.

(g) Tune the receiver station selector control so as to pick up the 600 kc. signal, disregarding the dial reading at which it is best received.

(h) Change the oscillograph synchronizing switch to "Ext." and place the oscillator modulation switch to "Off." Interconnect the frequency modulator and oscillator with the special shielded patch cord. Return the range control of the oscillograph to its No. 2 position and set the frequency control slightly above its mid-position.

(i) Shift the test oscillator to its 200-400 kc. range and tune it to the point at which the forward and reverse waves show on the oscillograph screen. This condition will obtain at an oscillator setting of approximately 230 kc. The signal obtained from the oscillator for this adjustment will be the third harmonic of 200 kc. An increase in the oscillator output may be necessary. The trimmer C-12 should then be adjusted to the point which produces maximum amplitude of the oscillographic images. It will not be necessary to rock the tuning control for this adjustment, inasmuch as the frequency modulator is varying the signal in an equivalent manner.

(j) Retune trimmers C-13, C-9, and C-4 as in (c), (d), and (e) to correct for any change in high-frequency alignment which may have been caused by the adjustment of C-12.

After the receiver has been replaced in the car, it may be necessary to make a final correction of the dial pointer by tuning in a station of known frequency and adjusting the pointer by means of the slotted screw head on the rear of the control head.

OUTPUT METER ALIGNMENT

Place the receiver in operation with its two covers removed. Attach the output indicator across the loudspeaker voice coil circuit or across the output transformer primary. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test oscillator output control so that the signal level is as low as possible and still observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

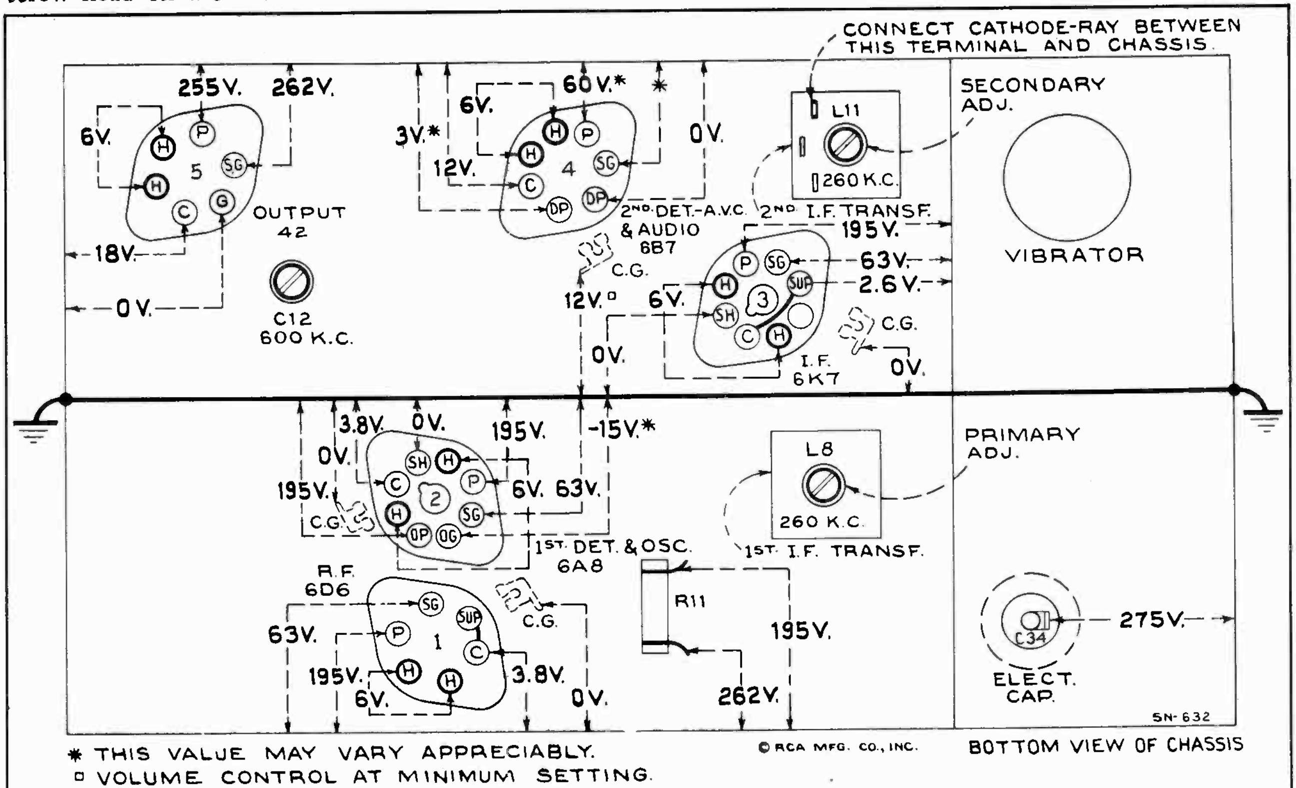


Figure 5—Radiotron Socket Voltages and Trimmer Locations
(Measured at 6.3 volts battery supply—Volume Control Maximum—No Signal)

Radiotron Socket Voltages

Operating conditions of the basic circuits of this instrument may be determined by measuring the voltages applied to the tube elements. Figure 5 shows the voltage values from the socket contacts to ground and appearing across the heater contacts (H-H). Each value as specified should hold within ±20% when this instrument is normally operative, with all tubes intact and rated voltage applied. Variations in excess of this limit will usually be indicative of trouble.

The voltages given on this diagram are actual measured voltages, and are obtained with the voltmeter load in the circuit.

To fulfill the conditions under which the d-c voltages were measured requires a 1,000-ohm-per-volt d-c voltmeter having ranges of 10, 50, 250, and 500 volts. Voltages below 10 volts should be measured on the 10-volt scale; between 10 and 50 on the 50-volt scale; between 50 and 250 on the 250-volt scale; and above 250 on the 500-volt scale.

For meters of the 1,000-ohm-per-volt type, but ranges other than above, use the nearest ranges to those specified. If the range is higher the voltage may be higher, if the range is lower the voltage may be lower; either condition depending on the percentage of circuit current drawn by the meter.

I-F Adjustments

(a) Connect the output of the test oscillator to the control grid cap of the i-f tube (RCA-6K7) through a 0.25 mfd. capacitor and connect the ground of the oscillator to the receiver chassis. Adjust the frequency of the oscillator to 260 kc. Tune the receiver to a point where no interference is received from the heterodyne oscillator or local stations.

(b) Adjust the two screws (attached to molded cores) of the second i-f transformer, one on top and one on bottom, until maximum output is produced by the indicating device.

(c) Remove the oscillator from the i-f tube input and connect it between the control grid cap of the first detector tube (RCA-6A8) and chassis-ground, using the 0.25 mfd. capacitor as previously. Allow its tuning to remain at 260 kc. Tune the receiver to avoid interference as in (a).

(d) Adjust the two screws of the first i-f transformer for maximum (peak) receiver output. The indication for this adjustment will be broad, due to the "flat-top" characteristic of the i-f system. The two screws should, therefore, be very carefully adjusted so that the indicator remains fixed at maximum as the oscillator is shifted through a range 2 kc. above and below its normal setting of 260 kc. An irregular double-peaked indication is to be avoided.

R-F Adjustments

NOTE: Before making r-f adjustments, it may be advisable to replace the bottom cover to eliminate vibrator interference.

(a) Adjust the dial pointer on the remote control head by the following procedure. Rotate tuning knob to its extreme clockwise position irrespective of location of pointer on dial. Now turn the pointer adjusting screw in the center of the back of the control unit until the pointer is at the end calibration mark beyond the **55** on dial scale.

(b) Connect the output of the test oscillator to the antenna-ground terminals of the receiver with a **175 mmfd.** capacitor in series with the antenna lead.

NOTE: For r-f alignment of receivers in which the tubular paper condenser **C-3** *(***.01 mfd.***) has been replaced by the small molded condenser,* **500 mmfd.** *(change easily identified by reference to Figure 2 and bottom of chassis), use a* **.001 mfd.** *capacitor instead of the* **175 mmfd.** *capacitor in series with the antenna lead and test oscillator.*

There should be a shunt capacitor of **50** or **60 mmfd.** from the antenna lead at the receiver to ground. Tune the oscillator to 1,400 kc. Allow the output indicator to remain attached to the receiver output.

(c) Tune the receiver so that the dial reading is 1,400 kc. Then adjust the oscillator, detector, and antenna coil trimmers, C-13, C-9, and C-4 respectively, tuning each to the point producing maximum indicated receiver output.

(d) Shift the oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. The oscillator series trimmer, C-12, should then be adjusted, simultaneously rocking the receiver tuning control backward and forward through the signal until maximum (peak) receiver output results from the combined operations. The adjustment of C-13, C-9, and C-4 should be repeated as in (c) to correct for any change in its alignment due to the adjustment of C-12.

Final Tuning Dial Adjustment

Final adjustment of the dial pointer may be made during operation after the receiver is installed in automobile. To do this tune in a station of known frequency (say **760 kc.**—approximately **76** on dial) as accurately as possible. Now reset the dial pointer to exactly **76** on the dial by means of the adjusting screw at center rear of operating head.

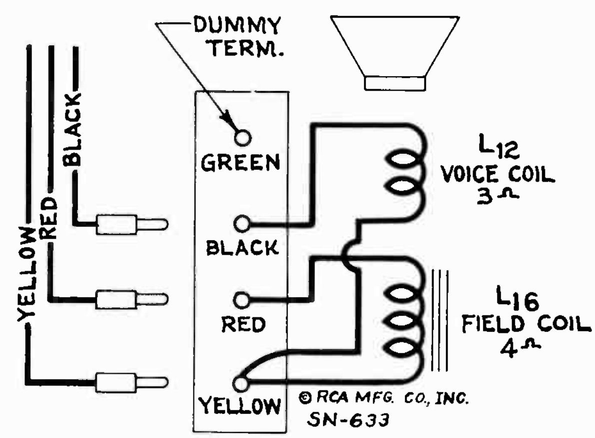


Figure 6—Loudspeaker Schematic and Wiring

Interrupter

The mechanical interrupter used in the power system is constructed with a plug-in base, so as to be easily removed from the receiver. Its adjustments have been correctly set during manufacture by means of special equipment. In cases of faulty operation of the interrupter, a renewal should be made.

The symmetrical plug-in base on this device permits the unit to be placed in its socket so as to give correct output voltage polarity on an automobile with either a positive or negative "A" ground. For installation with positive "A" ground, insert vibrator so positive (+) symbol is nearest label on vibrator compartment partition; for negative "A" ground, insert with negative (–) symbol nearest label.

Radiotrons

Deterioration of tubes and their approach to failure is usually evidenced by noisy or intermittent operation, loss of sensitivity and distorted tone quality. When suspected as faulty, the tubes should be removed from the receiver and checked with standard tube testing apparatus. It is not feasible to test the tubes while in the receiver, due to measurement inaccuracies which would result from the effects of the circuits.

Tuning Condenser Drive

Smooth control should be obtained over the entire tuning range of the variable condenser. If irregularity is present, check the action of the gear mechanism for binding or backlash at every point within the tuning range. A bind may be due to improper mesh between the worm gear and the large gears on the condenser shaft. To correct such a condition, loosen the three screws holding the gear plate and adjust the mesh of the gears to a position which gives smooth operation. Gear backlash is prevented by the small compression spring between the two large gears on the rotor shaft.

Receiver Housing

The screws holding the receiver chassis to the case must all be in place and tightly installed, inasmuch as they appreciably affect the ground resistance of the assembly and will consequently have a bearing on the amount of ignition noise received.

Volume Control and Power Switch

This adjustment is made by turning the small control knob fully clockwise and then fully counterclockwise. This places the friction clutch mechanism on the volume control in proper alignment.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12511	Cap—Grid contact cap—Package of 5	$0.15
11130	Capacitor—Adjustable capacitor—(C12)	.40
11289	Capacitor—50 Mmfd.—(C21)	.25
12270	Capacitor—80 Mmfd.—(C15)	.28
11998	Capacitor—115 Mmfd.—(C16, C17, C19, C20)	.28
12725	Capacitor—150 Mmfd.—(C23)	.28
11181	Capacitor—265 Mmfd.—(C11, C46, C47)	.20
12761	Capacitor—265 Mmfd.—(C22)	.15
11171	Capacitor—400 Mmfd.—(C27)	.22
12762	Capacitor—1,000 Mmfd.—(C35, C44)	.20
12268	Capacitor—1,400 Mmfd.—(C6)	.34
12269	Capacitor—2,200 Mmfd.—(C7)	.42
5148	Capacitor—.007 Mfd.—(C38, C40)	.20
4838	Capacitor—.005 Mfd.—(C31)	.20
4858	Capacitor—.01 Mfd.—(C3, C28)	.25
11315	Capacitor—.015 Mfd.—(C24)	.20
5196	Capacitor—.035 Mfd.—(C32)	.18
4836	Capacitor—.05 Mfd.—(C18)	.30
4839	Capacitor—0.1 Mfd.—(C26)	.28
4841	Capacitor—0.1 Mfd.—(C10)	.22
12237	Capacitor—.25 Mfd.—(C39, C42)	1.02
12484	Capacitor—.25 Mfd.—(C30)	.24
5019	Capacitor—0.5 Mfd.—(C41)	.42
12234	Capacitor—8 Mfd.—(C34)	1.34
12233	Capacitor Pack—Comprising 2 sections each, .01 Mfd.—(C36, C37)	1.02
12238	Capacitor Pack—Comprising one 8 Mfd. and two 10 Mfd. sections—(C25, C29, C33)	2.30
12223	Coil—Antenna coil—(L3)	.94
12235	Coil—Choke coil—(L14)	.50
12225	Coil—Oscillator coil—(L6, L7)	.80
12224	Coil—R. F. coil—(L4, L5)	1.32
12220	Condenser—3-gang variable tuning condenser—(C4, C5, C8, C9, C13, C14)	4.50
12006	Core—Adjustable core for I. F. transformer Stock No. 12228 and No. 12229	.22
12289	Coupling—Station selector flexible shaft coupling	.20

Stock No.	DESCRIPTION	List Price
12239	Filter—Antenna filter—(L1, L2, C2)	$1.28
12221	Gear—Variable tuning condenser shaft drive gear (without tapped shaft)	.36
12222	Gear—Variable tuning condenser worm gear (use with No. 12221 only)	.36
12242	Guide—Station selector shaft guide	.18
12483	Pin—Contact pin for speaker leads—Package of 5	.15
12485	Pin—Contact pin for tone control lead—Package of 5	.15
12232	Reactor—Filter reactor—iron core—(L13)	1.10
5034	Resistor—56 ohm—carbon type, ½ watt—(R21, R22)—Package of 5	1.00
12512	Resistor—470 ohm—insulated, ¼ watt—(R2)—Package of 5	1.00
11845	Resistor—560 ohm—carbon type, 1 watt—(R19)—Package of 5	1.10
12262	Resistor—680 ohm—insulated, ¼ watt—(R7)—Package of 5	1.00
8097	Resistor—5,600 ohm—carbon type, 2 watt—(R11)	.25
12288	Resistor—10,000 ohm—insulated, ¼ watt—(R12)—Package of 5	1.00
12454	Resistor—33,000 ohm—insulated, ¼ watt—(R17)—Package of 5	1.00
5132	Resistor—47,000 ohm—carbon type, 1/10 watt—(R8, R9)—Package of 5	.75
12073	Resistor—47,000 ohm—carbon type, 1 watt—(R5)—Package of 5	1.10
12286	Resistor—56,000 ohm—insulated, ¼ watt—(R3)—Package of 5	1.00
12455	Resistor—120,000 ohm—insulated, ¼ watt—(R15)—Package of 5	1.00
12452	Resistor—330,000 ohm—insulated, ¼ watt—(R18)—Package of 5	1.00
11452	Resistor—470,000 ohm—carbon type, 1/10 watt—(R4, R6)—Package of 5	.75
12285	Resistor—470,000 ohm—insulated, ¼ watt—(R1)—Package of 5	1.00
12200	Resistor—1 megohm—insulated, ¼ watt—(R16)—Package of 5	1.00

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
12287	Resistor—1.5 megohm—insulated, ¼ watt—(R13, R14)—Package of 5	$1.00
3584	Ring—Retaining ring for R. F. or oscillator coil—Package of 5	.40
5129	Ring—Radiotron shield ring—Package of 5	.10
3623	Shield—R. F. or oscillator coil shield	.30
12290	Shield—Radiotron shield	.18
4786	Socket—6-contact 6D6 or 42 Radiotron socket	.15
4787	Socket—7-contact 6B7 Radiotron socket	.15
12227	Socket—8-contact 6A8 or 6K7 Radiotron socket	.18
12241	Socket—Vibrator socket	.18
12226	Stud—Variable tuning condenser mounting stud assembly—Package of 4	.22
12228	Transformer—First I. F. transformer—(L8, L9, C16, C17, R4, R6)	2.24
12364	Transformer—Output transformer—(T2)	1.48
12229	Transformer—Second I. F. transformer—(L10, L11, C19, C20, C22, R9)	2.02
12231	Transformer—Vibrator power transformer—(T1)	3.42
12236	Vibrator—Vibrator complete	4.55
12365	Volume Control—(R10)	1.12
	CONTROL BOX AND FLEXIBLE SHAFT ASSEMBLIES	
12505	Box—Control box complete—less flexible shafts	6.35
12578	Dial—Station selector indicator dial (standard)	.50
12579	Knob—Station selector (tuning) knob (standard)	.28
12580	Knob—Volume control knob (standard)	.28
11891	Lamp—Control box dial lamp—Package of 5	.65
12504	Shaft—Tuning control flexible shaft complete, approx. 21½ in. long	1.20
12503	Shaft—Volume control flexible shaft complete, approx. 21½ in. long	1.20
	REPRODUCER ASSEMBLIES	
12482	Board—Reproducer terminal board	.30
12450	Coil—Field coil—(L16)	1.60
12451	Cone—Reproducer cone complete—(L12)	1.60
9687	Reproducer—Reproducer complete	5.65
	MISCELLANEOUS ASSEMBLIES	
4287	Body—Antenna cable female connector body—Package of 10	.40
4289	Body—"A" lead fuse connector body—Package of 10	.35

Stock No.	DESCRIPTION	List Price
12509	Button—Plug button for receiver housing	$0.16
12444	Cable—Shielded antenna cable, approx. 8 in. long, complete with female section of connector	.58
12473	Cable—Shielded antenna lead-in cable, approx. 31 in. long, complete with 2 male sections of connector	1.12
4288	Cap—Male connector cap for "A" lead or antenna cable—Package of 10	.36
5025	Capacitor—Generator capacitor	.40
4293	Capacitor—Ammeter capacitor	.60
11418	Capacitor—.5 Mfd.—(C43)	.50
4291	Clip—"A" lead ammeter clip—Package of 10	.70
12443	Cover—Receiver housing top cover	.64
12442	Cover—Receiver housing bottom cover assembly	.60
12247	Fastener—Receiver housing top cover fastener—Package of 10	.30
4286	Ferrule—Antenna cable or "A" lead connector ferrule and bushing—Package of 10	.38
5023	Fuse—"A" lead fuse—15 amp.—Package of 5	.40
12449	Grille—Speaker grille assembly	.88
12441	Housing—Receiver housing complete	4.58
4290	Insulator—Fuse connector insulator—Package of 10	.35
4323	Knob—Tone control knob—Package of 5	.70
12445	Lead—"A" lead (set end), approx. 8 in. long, complete with male section of connector	.26
12501	Plate—Name plate and mounting screws	.20
12447	Screw—Speaker mounting assembly—Comprising 1 screw, 1 nut, and 1 lock-washer to mount speaker in case—Package of 4	.26
12252	Screw—No. 8 self-tapping hex. head screw—used on receiver housing—Package of 10	.20
12248	Socket—3-contact socket and bracket assembly for reproducer cable	.20
12502	Socket—Pin socket and bracket assembly for tone control lead	.30
4284	Spring—Antenna cable connector spring—Package of 10	.30
12448	Stud—Receiver mounting stud assembly—Comprising 1 stud, 1 washer, 1 lock-washer and 1 nut	.20
5024	Suppressor—Distributor suppressor	.38
12249	Tone Control—(R20)	.88
4285	Washer—Antenna cable connector insulating washer—Package of 10	.22

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Howl when tuned to, or tuning in, a station is generally correctable by loosening the screws supporting gang tuning condenser to provide increased flexibility.

First Edition

SUPPLEMENT TO

RCA VICTOR MODELS 5M, 6M, and 6M2

First Production (Serial Nos. below 200,000)

On the first production receivers, two types of variable condensers are used. These condensers differ only in the method of mounting the drive gear. Stock Nos. 12221 and 12222 gears are used only with the tuning condenser not having a tapped shaft. The gears for the condenser with a tapped shaft are:

Stock No.	Description	List Price
13145	Gear--Variable tuning condenser shaft drive gear for use on tuning condenser with tapped shaft	.35
13146	Gear--Variable tuning condenser worm--for use with drive gear Stock No. 13145 only	.65

The following parts are additional to those listed for Models 5M, 6M, and 6M2:

Control Box Assemblies

13147	Gear--Pinion gear and slotted shaft assembly	.55
13452	Switch--"On-off" operating switch	.60

Miscellaneous Assemblies

13006	Sleeve--Tuning or volume control flexible shaft sleeve Package of 2	.30

Reproducer Assemblies (Model 6M2 only)

11984	Connector--3-contact male connector for reproducer cable Stock No. 12525	.22

Second Production Receivers (Serial Nos. 200,000 and above) employed a tuning drive mechanism with a tuning drive ratio of 16 to 1. The following parts are applicable to these receivers:

13371	Condenser--3-gang variable tuning condenser (16 to 1 ratio)	4.85
13372	Gear--Variable tuning condenser shaft drive gear for Stock No. 13371	.35
13373	Gear--Variable tuning condenser worm gear and mounting bracket for use with drive gear Stock No. 13372 .	.65
13414	Box--Control box complete less flexible shafts	6.10

RCA VICTOR MODEL 5T

Five-Tube, Two-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard broadcast" (A) .... 540-1,820 kc.
"Short wave" (B) .... 1,820-6,600 kc.

ALIGNMENT FREQUENCIES
"Standard broadcast" (A) .... 600 kc. (osc.), 1,700 kc. (osc., ant.)
"Short wave" (B) .... None required

Intermediate Frequency .... 460 kc.

RADIOTRON COMPLEMENT
(1) RCA-6A7 .... First Det.—Oscillator
(2) RCA-6D6 .... Intermediate Amplifier
(3) RCA-75 .... Second Det., A-F Amp. and A.V.C.
(4) RCA-42 .... Audio Power Amplifier
(5) RCA-80 .... Full-Wave Rectifier

Pilot Lamps (3) .... Mazda No. 46, 6.3 volts, 0.25 amperes

POWER SUPPLY RATINGS
Rating A .... 105-125 volts, 50-60 cycles, 80 watts
Rating B .... 105-125 volts, 25-60 cycles, 80 watts
Rating C .... 100-130/140-160/195-250 volts, 40-60 cycles, 80 watts

POWER OUTPUT RATING
Undistorted .... 2.0 watts
Maximum .... 4.5 watts

LOUDSPEAKER
Type .... Electrodynamic
Voice Coil Impedance .... 2.2 ohms at 400 cycles

Mechanical Specifications

Height	18½ inches
Width	13¼ inches
Depth	7⅞ inches
Weight (Net)	21 pounds
Weight (Shipping)	26 pounds
Chassis Base Dimensions	12 inches x 7 inches x 2½ inches
Over-all Chassis Height	7½ inches
Operating Controls	(1) Power Switch—Tone, (2) Tuning, (3) Volume, (4) Range Selector
Tuning Drive Ratio	10 to 1

General Features

This receiver is of the superheterodyne type and has many distinctive features. Its design includes magnetite core adjusted i-f transformers and wave trap, aural compensated volume control, tone control, resistance coupled audio system, phonograph terminal board, band selective illumination of dial scales, and an 8-inch dust-proof electrodynamic loudspeaker.

Tuning is continuous through the "Standard broadcast" and "Short wave" bands (including 49 meters). The "Short wave" position of this extensive range also includes channels assigned for police, amateur, and aviation communication. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of ten to one permits ease of tuning, especially in the "Short wave" band.

Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A7. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (magnetite core adjusted) wave trap is connected across the primary of this transformer to prevent signals of intermediate frequency **(460 kc.)** from being introduced into the first stage as interference. The two-section gang condenser, which tunes the antenna transformer secondary and the heterodyne oscillator coil, has adjustable

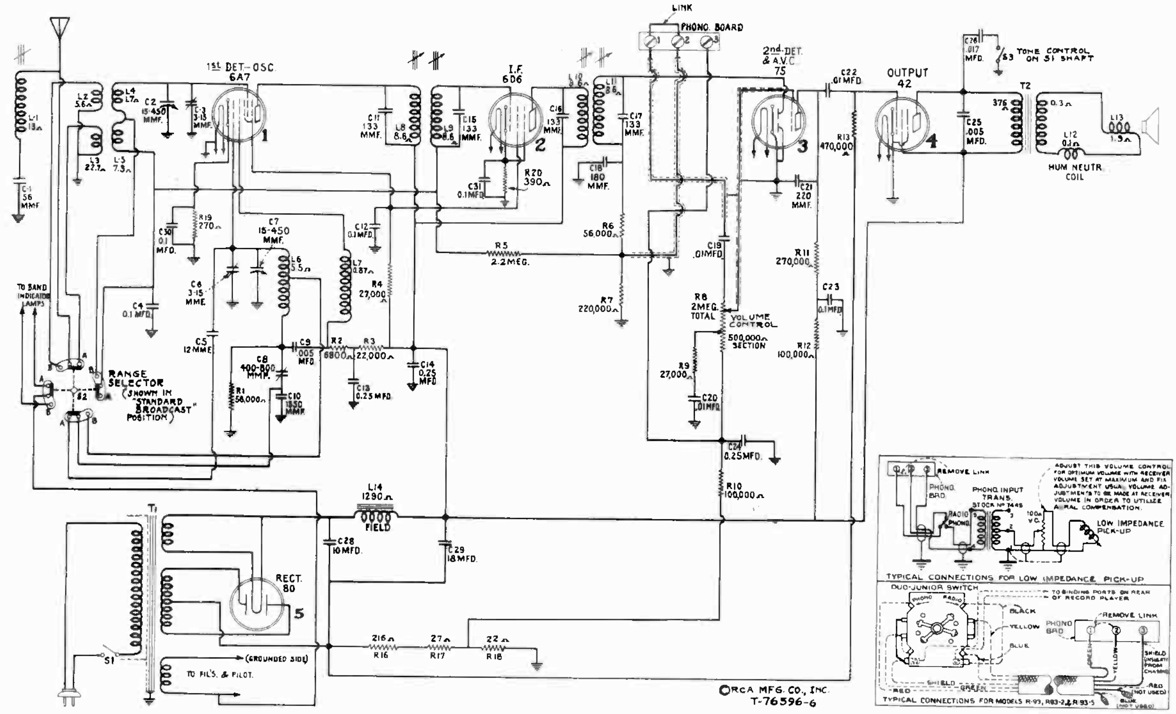


Figure 1—Schematic Circuit Diagram

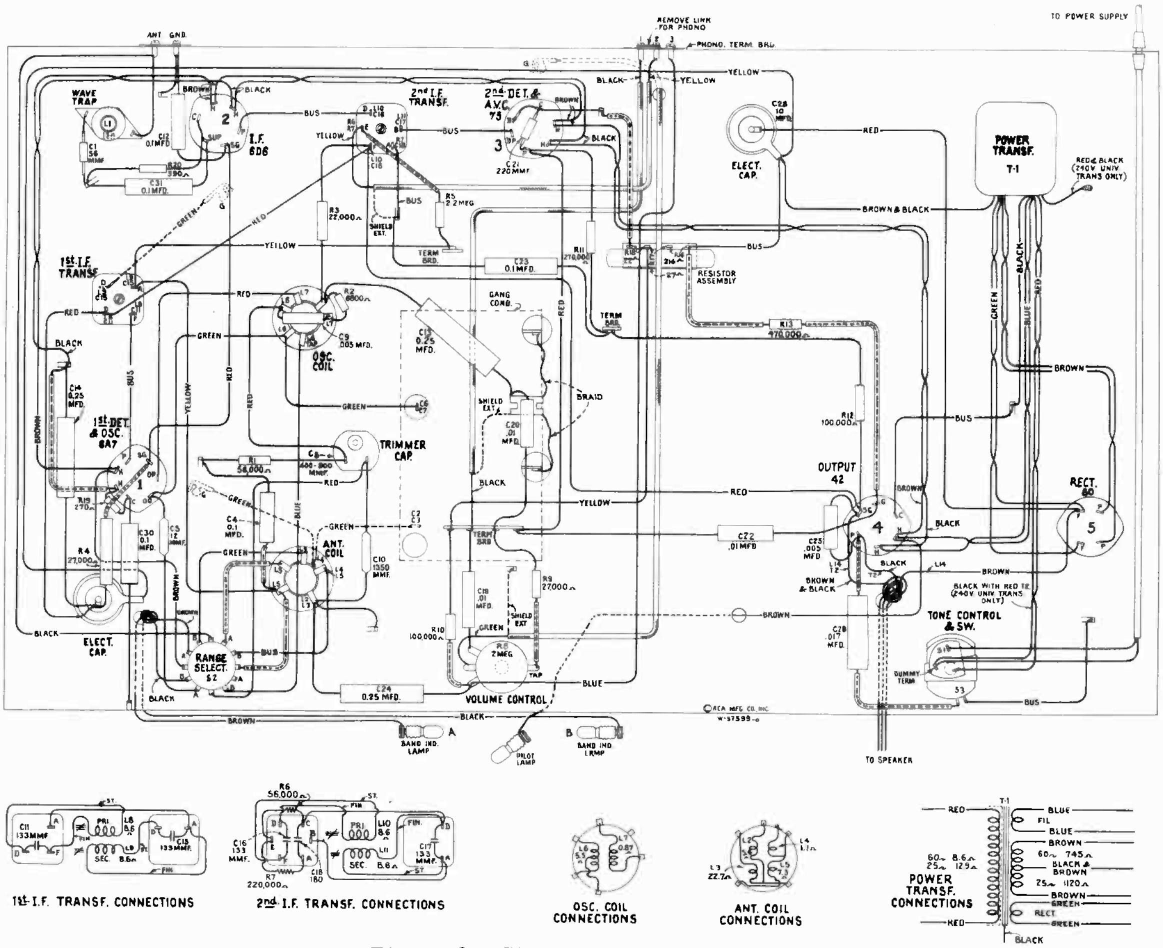


Figure 2—Chassis Wiring Diagram

trimmers for obtaining exact alignment. Each of these coils is tapped so that the range switch increases the range of tuning by decreasing the amount of inductance.

The intermediate frequency stage is coupled to the RCA-6A7 and to the RCA-75 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 460 **kc.**

The modulated signal as obtained from the output of the i-f system is detected by one of the diodes of the RCA-75 tube. Audio frequency secured by this process is passed on to the control grid of this same tube for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R7, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter. Minimum operating bias for the RCA-6A7 and RCA-6D6 tubes is developed across resistors R19 and R20 respectively.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-75, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-42 power output stage, which, in turn, is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch S3.

The power supply system consists of an RCA-80 rectifier tube which is supplied from an efficiently designed power transformer and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits are obtained from the output of the filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R3, L2, C1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

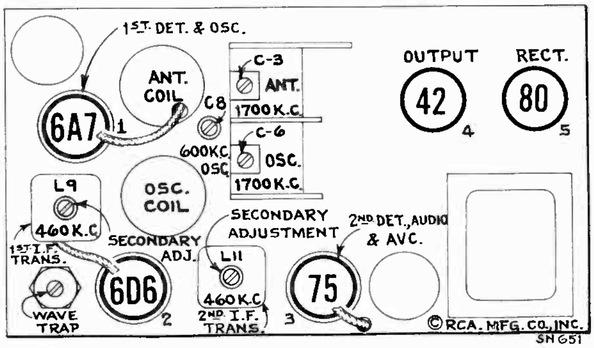


Figure 3—Radiotron, Coil, and Trimmer Locations

Alignment Procedure

There are three alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595**, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Core Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 7. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil or across the output transformer primary.

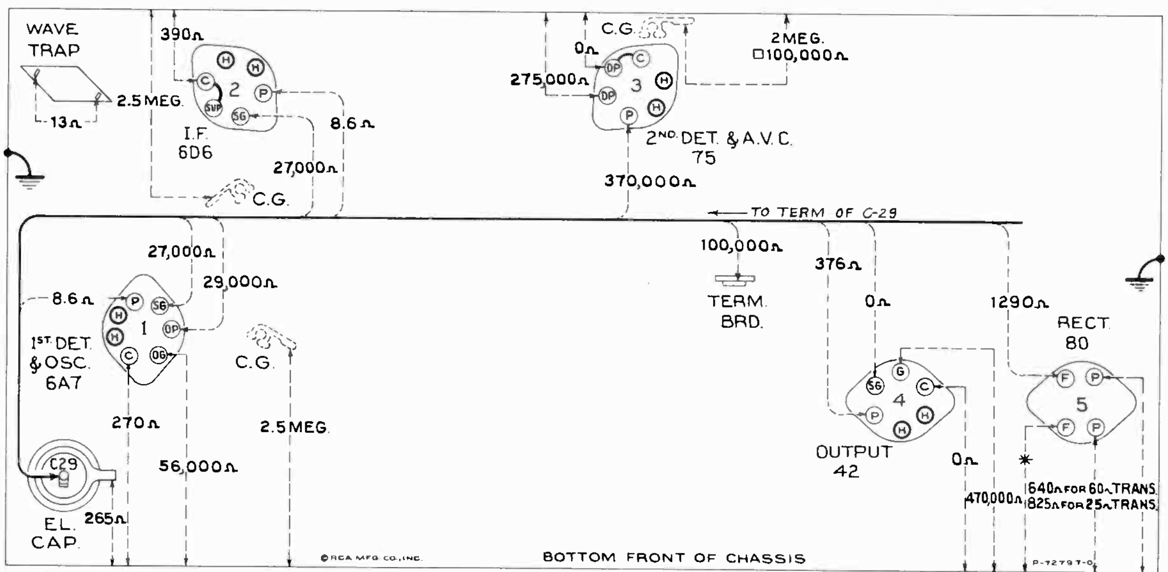
Connect the output of the test oscillator to the control grid of the RCA-6A7 through a **.05 mfd.** capacitor. Connect the test oscillator ground terminal to the ground terminal of the receiver chassis. Range selector should be in "Short wave" position. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered either from local broadcast stations or from the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust the two magnetite core screws of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment.

Wave-Trap Adjustment

Attach the output of the test oscillator to the receiver "Antenna" terminal through a **200 mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to **460 kc.** and range selector in "Short wave" position as before. Then adjust the wave-trap screw to the point which causes maximum suppression of the 460 **kc.** signal.

R-F Trimmer Adjustments

Calibrate the tuning dial by setting the pointer to a horizontal position (53 on "Standard broadcast" scale) with the two-gang tuning condenser in full mesh. The output indicator should be left connected to the system. Connections for the test oscillator remain the same as for "Wave-trap adjustment." Adjust the test oscillator to **1,700 kc.** and set the receiver tuning control to a dial reading of **1,700 kc.** Leave the volume control of the receiver at its maximum position. Make sure that the range selector is at its broadcast position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimmers, **C6** and **C3,** of the oscillator and antenna transformer coils (mounted on the variable condenser) so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator to **600 kc.** Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then, adjust the receiver oscillator series trimmer, **C8,** simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at **1,700 kc.** should then be repeated to correct for any change which may have been caused by the oscillator series trimmer adjustment.



*OPEN CIRCUIT (LEAKAGE OF ELECTROLYTIC CONDENSERS ONLY) □ VOLUME CONTROL AT "MINIMUM" POSITION

Figure 4—Resistance Diagram

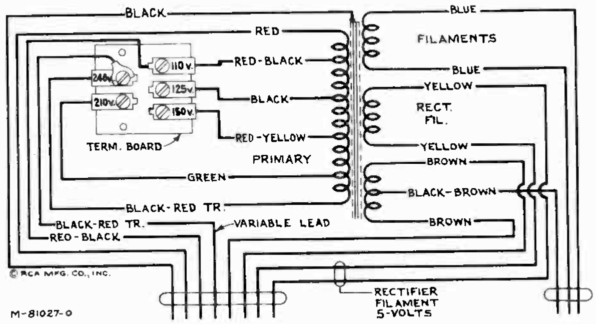
Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—Volume control maximum

Resistance Measurement

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with the Radiotrons in sockets; tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical



Primary Resistance—21.5 ohms Total
Secondary Resistance—760 ohms Total

Figure 5—Universal Transformer

methods of connecting a low-impedance pick-up, or the RCA Victor Models R-93, R-93-2, and R-93S phonographs are shown on the schematic diagram (figure 1).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers

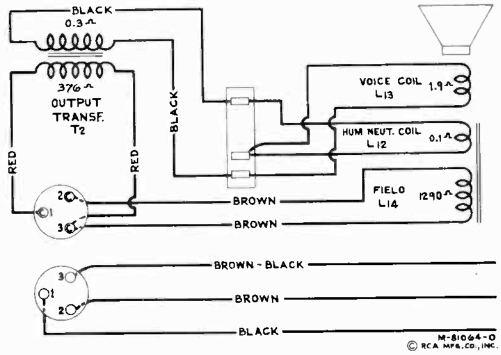


Figure 6—Loudspeaker Wiring

after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

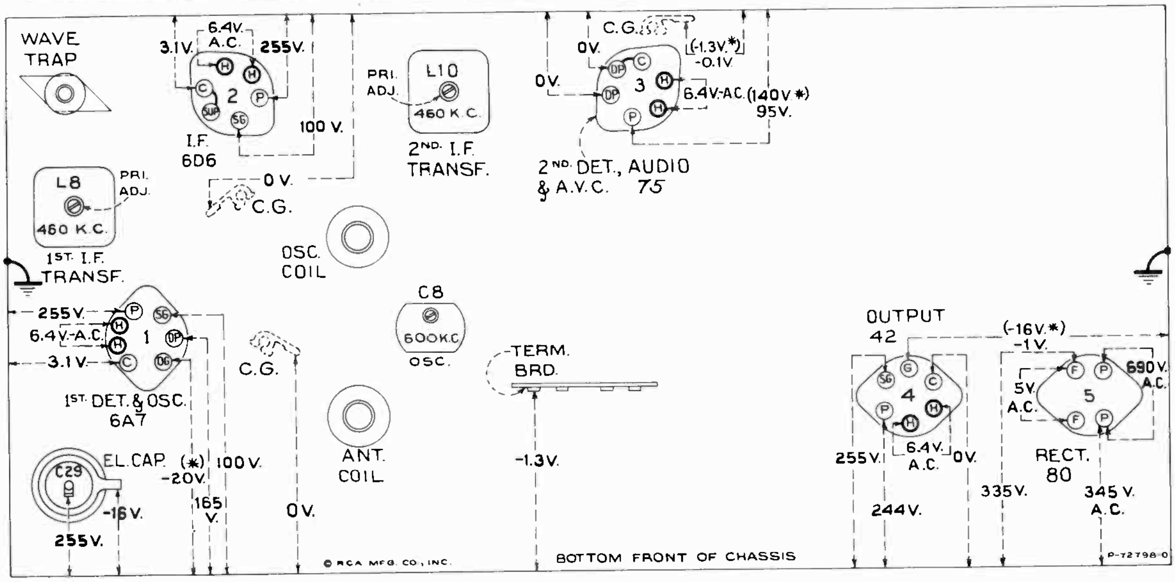


Figure 7—Radiotron Socket Voltages, Coil and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc. ("Standard broadcast")—No signal being received—Volume control minimum

Radiotron Socket Voltages

***Note:** Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc., no signal being received and volume control set at minimum. To duplicate the conditions under which the voltages were measured requires a 1,000 ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the voltage to be measured. A-C voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing — Variable condenser mounting bushing assembly—Package of 3......	$0.43
11591	Button—Chassis plug button...........	.10
12118	Cap—Grid contact cap—Package of 5...	.15
11465	Capacitor—Adjustable capacitor (C8)...	.48
12659	Capacitor—12 Mmfd. (C5)...........	.20
12661	Capacitor—56 Mmfd. (C1)...........	.20
12946	Capacitor—133 Mmfd. (C11, C15, C16, C17)...........	.20
12406	Capacitor—180 Mmfd. (C18)..........	.26
12662	Capacitor—220 Mmfd. (C21)..........	.20
12660	Capacitor—1,350 Mmfd. (C10).........	.28
4868	Capacitor—.005 Mfd. (C9, C25).......	.20
4858	Capacitor—.01 Mfd. (C19, C20, C22)...	.25
11451	Capacitor—.017 Mfd. (C26)...........	.18
4841	Capacitor—.1 Mfd. (C4, C12, C23, C30, C31)...........	.22
4840	Capacitor—.25 Mfd. (C13, C24).......	.30
5170	Capacitor—.25 Mfd. (C14)...........	.25
11240	Capacitor—10 Mfd. (C28)............	1.08
5212	Capacitor—18 Mfd. (C29)............	1.16
12648	Coil—Antenna coil—less shield (L2, L3, L4, L5)...........	1.35
12649	Coil—Oscillator coil—less shield (L6, L7)	1.20
12643	Condenser—2-gang variable tuning condenser (C2, C3, C6, C7)...........	3.46
5119	Connector—3-contact female speaker cable connector...........	.25
12006	Core—Adjustable core and stud assembly for I.F. transformer, Stock Nos. 12652 and 12653...........	.22
12664	Core—Adjustable core and stud assembly for wave trap, Stock No. 12654......	.22
12658	Dial—Station selector dial............	.65
12656	Drive—Variable condenser drive shaft and pinion...........	.58
12655	Gear—Large gear located on variable condenser shaft...........	.34
12657	Indicator—Station selector indicator.....	.20
5226	Lamp—Dial lamp—Package of 5.......	.70
12663	Mask—Dial light diffuser, complete with red and green colored screen.........	.30
12647	Range Switch (S2)...........	.68
12206	Resistor—270 ohm, carbon type, ¼ watt—Package of 5 (R19)...........	1.00
12261	Resistor—390 ohm, insulated, ¼ watt—Package of 5 (R20)...........	1.00
8070	Resistor—22,000 ohm, carbon type, ½ watt—Package of 5 (R3)...........	1.00
11400	Resistor—27,000 ohm, carbon type, ¼ watt—Package of 5 (R9)...........	1.00
12011	Resistor—27,000 ohm, carbon type, 1 watt—Package of 5 (R4)...........	1.10
11282	Resistor—56,000 ohm, carbon type, 1/10 watt—Package of 5 (R6)...........	.75
5029	Resistor—56,000 ohm, carbon type, ¼ watt—Package of 5 (R1)...........	1.00
11454	Resistor—6,800 ohm, carbon type, ¼ watt—Package of 5 (R2)...........	1.00
5145	Resistor—100,000 ohm, carbon type, ¼ watt—Package of 5 (R10, R12)......	1.00
11398	Resistor—220,000 ohm, carbon type, 1/10 watt—Package of 5 (R7)...........	.75
11323	Resistor—270,000 ohm, carbon type, ¼ watt—Package of 5 (R11)..........	1.00
11172	Resistor—470,000 ohm, carbon type, ¼ watt—Package of 5 (R13)...........	1.00
11626	Resistor—2.2 megohm, carbon type, ¼ watt—Package of 5 (R5)...........	1.00
12004	Resistor—Voltage divider resistor — Comprising one 216 ohm, one 27 ohm and one 22 ohm sections (R16, R17, R18).	.45
12650	Shield—Antenna coil shield............	.22
12735	Shield—Dial lamp shield—Package of 5..	.25
12607	Shield—First I.F. transformer shield top.	.30
12008	Shield—First or second I.F. transformer shield...........	.28
12651	Shield—Oscillator coil shield...........	.22
12581	Shield—Second I.F. transformer shield top	.36
3950	Shield—6D6 Radiotron shield..........	.26
3682	Shield—6A7 or 75 Radiotron shield.....	.22
4794	Socket—4-contact rectifier Radiotron socket...........	.15
4786	Socket—6-contact 42, 75 and 6D6 Radiotron socket...........	.15
4787	Socket—7-contact 6A7 Radiotron socket.	.15
11199	Socket—Dial lamp socket.............	.14
12007	Spring—Retaining spring for core, Stock Nos. 12006 and 12664—Package of 10	.36
11460	Tone Control and Switch (S1, S3)......	.95
13106	Transformer—First I.F. transformer, complete (L8, L9, C11, C15)...........	1.60
12644	Transformer—Power transformer, 115 volt, 60 cycle (T1)...........	4.00
12645	Transformer—Power transformer, 115 volt, 25 cycle (T1)...........	5.90
12646	Transformer—Power transformer, 240-210-150-125-110 volts, 60 cycle (T1)..	6.88
13107	Transformer—Second I. F. transformer, complete (L10, L11, C16, C17, C18, R6, R7)...........	2.06
12654	Trap—Wave trap (L1)..............	.75
13144	Volume Control (R8)...............	1.00
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board...........	.15
12640	Bracket — Output transformer mounting bracket...........	.18
12012	Coil—Field coil (L14)...............	1.85
11469	Coil—Neutralizing coil (L12)..........	.20
12642	Cone—Reproducer cone and dust cap (L13)...........	.94
5118	Connector—3-contact male speaker cable connector...........	.25
9699	Reproducer, complete................	6.38
11253	Transformer—Output transformer (T2).	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5.............	.20
	MISCELLANEOUS ASSEMBLIES	
12639	Escutcheon—Station selector escutcheon and crystal assembly...............	1.02
12638	Knob—Station selector knob — Package of 5...........	.58
11347	Knob—Tone control, volume control or range switch knob—Package of 5.....	.75
11586	Screw—Chassis mounting screw No. 14x1 in.—Package of 10................	.22
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12638—Package of 5.	.15

Prices quoted above are subject to change without notice.

First Edition

RCA VICTOR MODEL 5T4

Five-Tube, Three-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

Frequency or Wave-length Ranges

Band "X"	145-350 kc (approx. 2,068-857 meters)
Band "A"	525-1,550 kc (approx. 571-193 meters)
Band "C"	5.8-22 megacycles

Alignment Frequencies

Band "X"	175 kc (osc.), 350 kc (osc., det., ant.)
Band "A"	600 kc (osc.), 1,500 kc (osc., det., ant.)
Band "C"	20,000 kc (osc., ant.)

Intermediate Frequency ... 460 kc

Radiotron Complement

(1) RCA-6A7	First Det.—Oscillator
(2) RCA-6D6	Intermediate Amplifier
(3) RCA-75	Second Det., A-F Amp. and A.V.C.
(4) RCA-42	Audio Power Amplifier
(5) RCA-80	Full-Wave Rectifier

Pilot Lamps (2) ... Mazda No. 46, 6.3 volts, 0.25 ampere

Power Supply Ratings

Rating A	105-125 volts, 50-60 cycles, 75 watts
Rating B	105-125 volts, 25-50 cycles, 75 watts
Rating C	100-125/200-250 volts, 50-60 cycles, 75 watts

Power Output Rating

Undistorted	2.0 watts
Maximum	4.5 watts

Loudspeaker

Type	Electrodynamic
Voice Coil Impedance	2.2 ohms at 400 cycles

Mechanical Specifications

Height	$11\frac{13}{16}$ inches
Width	$23\frac{11}{16}$ inches
Depth	$10\frac{1}{16}$ inches
Weight (Net)	29 pounds
Weight (Shipping)	34 pounds
Chassis Base Dimensions	$13\frac{1}{2}$ inches x $7\frac{3}{4}$ inches x 3 inches
Over-all Chassis Height	$8\frac{7}{8}$ inches
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch–Tone
Tuning Drive Ratio	10 to 1 and 50 to 1

General Features

This receiver is of the superheterodyne type and has many distinctive features. Its design includes magnetite core adjusted i-f transformers and wave-trap, pre-selector stage on "A" and "X" bands, aural compensated volume control, tone control, resistance-coupled audio system, phonograph terminal board, and an 8-inch dust-proof electrodynamic loudspeaker.

Tuning range includes the "X," "A," and "C" bands. The "C" band of this extensive range includes channels assigned for amateur, and international short-wave broadcast on 49, 31, 25, 19, 16 and 13 meters. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of 10 to 1, with a 50 to 1 vernier, permits ease of tuning, especially in the "C" band.

Circuit Arrangement

The first-detector and oscillator functions are accomplished in a single tube, an RCA-6A7. The antenna is coupled to this tube through a tuned transformer in the "C" band, while a pre-selector stage is employed on bands "X" and "A" prior to the usual tuned detector circuits. A magnetite core adjusted wave-trap is connected in series with the antenna to effectively prevent signals of intermediate frequency **(460 kc)** from being introduced into the detector stage as interference. A three-section gang condenser tunes the antenna and detector transformer secondaries and the heterodyne oscillator coils. These

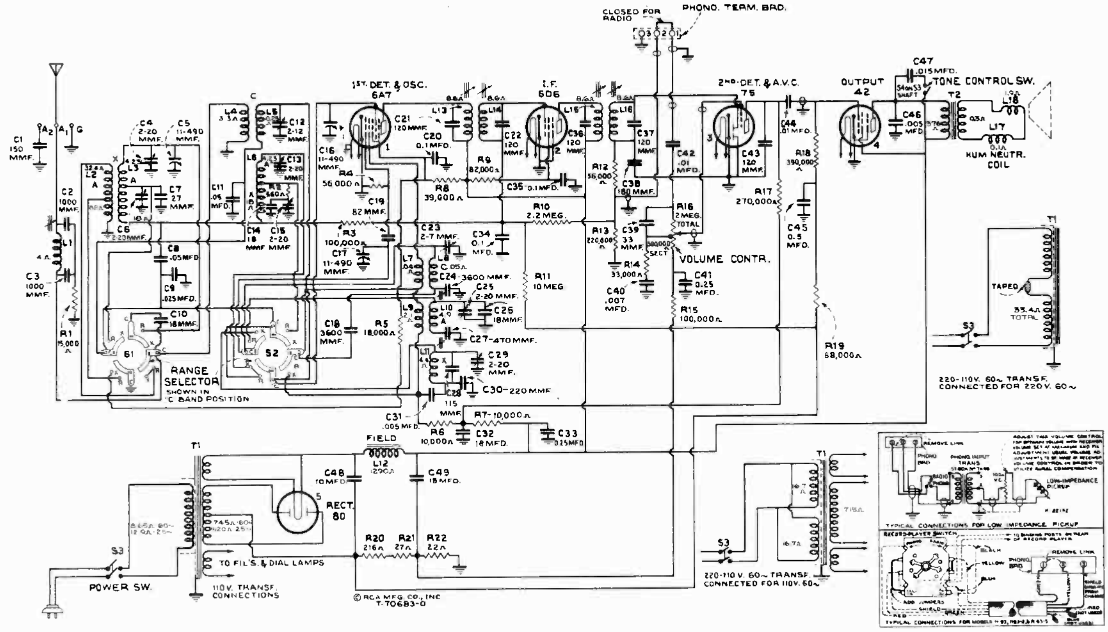


Figure 1—Schematic Wiring Diagram

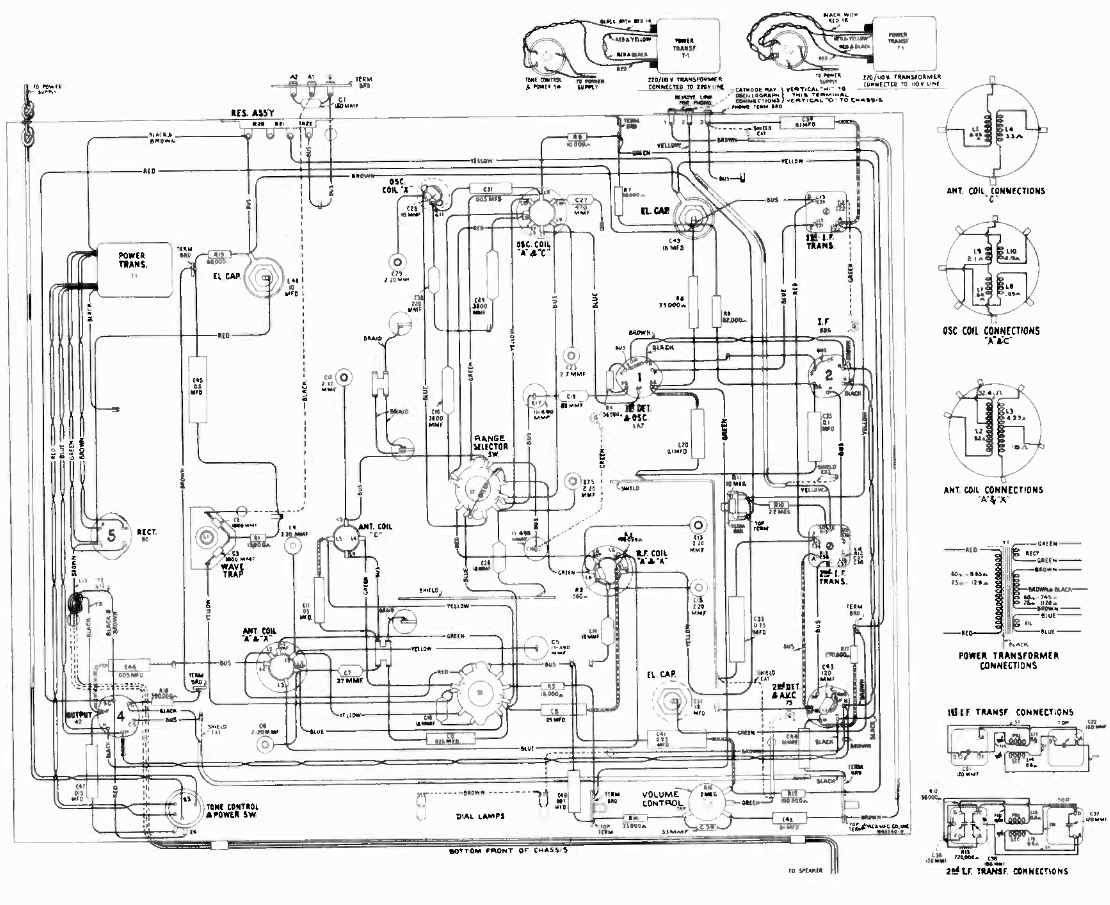


Figure 2—Chassis Wiring Diagram

coils are shunted by improved plunger-type, air-dielectric, adjustable trimming capacitors, for obtaining exact alignment.

The intermediate frequency stage is coupled to the RCA-6A7 and to the RCA-75 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to **460 kc.**

The modulated signal as obtained from the output of the i-f system is detected by one of the diodes of the RCA-75 tube. Audio frequency secured by this process is passed on to the control grid of this same tube for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R13, is applied as automatic control grid bias to the first-detector and i-f tubes through a suitable resistance filter.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-75, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-42 power output stage, which, in turn, is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch S4.

The power supply system consists of an RCA-80 rectifier tube, power transformer, and filter.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C1, R1,

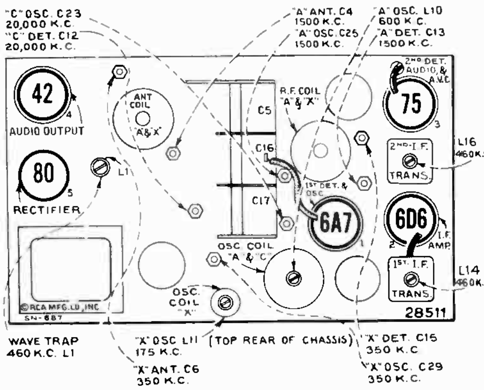


Figure 3—Radiotron, Coil, and Trimmer Locations

etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are ten alignment trimmers provided in the antenna transformer, detector, and oscillator coil tuned circuits. The i-f transformer, low-frequency oscillator, and wave-trap adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available for sale, through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595,** is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 6. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil.

Connect the "Ant" output of the test oscillator to the control grid of the RCA-6A7 through a **.001 mfd.** capacitor. Connect the test oscillator **"Gnd"** terminal to the ground terminal of the receiver chassis. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered from local broadcast stations or from the local (heterodyne) oscillator. To eliminate signals from the local oscillator short stator of C17 to chassis-ground. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust the two magnetite core screws of the second i-f transformer **L16** and **L15** to produce maximum (peak) indicated receiver output. Then adjust the two magnetite core screws **L14** and **L13** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment. Remove temporary jumper, stator C17 to chassis-ground if used.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme right-hand end calibration mark, on any scale, while the three-gang tuning condenser plates are in full mesh.

Wave-Trap Adjustment

Attach the "Ant" output of the test oscillator to the receiver "A1" terminal through a **200 mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to **460 kc.** Adjust range selector to band "A" position. Then adjust the wave-trap screw to the point which causes maximum suppression (minimum output) of the **460 kc** signal.

"C" Band

(a) Attach the "Ant" output of the test oscillator to the receiver "A1" terminal through a **300-ohm** resistor, leaving the "Gnd" of the oscillator connected to the receiver chassis.
Adjust range selector to band "C" position. Set receiver dial pointer to **20,000 kc** (20 on scale).

(b) Tune test oscillator to **20,000 kc.** Set oscillator trimmer **C23** to minimum capacity (plunger full out), and detector trimmer **C12** to maximum capacity (plunger full in). Slowly push in oscillator trimmer **C23** until maximum (peak) output is reached. Two peaks may be found. Adjust **C23** to the peak with minimum capacity (plunger near out) for maximum indication. Tighten lock nut. Slowly pull out plunger of detector trimmer **C12** until maximum (peak) indicated output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut.

"A" Band

(c) Attach the "Ant" output of the test oscillator to the receiver "A1" terminal through a **200 mmfd.** capacitor, leaving the "Gnd" of the oscillator connected to the receiver chassis. Adjust range selector to band "A" position. Reduce output of test oscillator to a minimum. Tune the test oscillator to **600 kc** and set receiver dial pointer to **600 kc (500 meters).** Adjust output of test oscillator until a slight indication of output is visible.

(d) Adjust the oscillator magnetite core screw **L10** (top of oscillator coil) so that maximum (peak) indicated output results.

(e) Set receiver dial pointer to **1,500 kc (200 meters).** Tune the test oscillator to **1,500 kc.** Carefully adjust the oscillator, detector, and antenna trimmers **C25, C13** and **C4** respectively so that each brings about maximum (peak) indicated output.

(f) Tune the test oscillator to **600 kc.** Adjust the receiver to pick up this signal disregarding the dial reading at which it is best received. Adjust

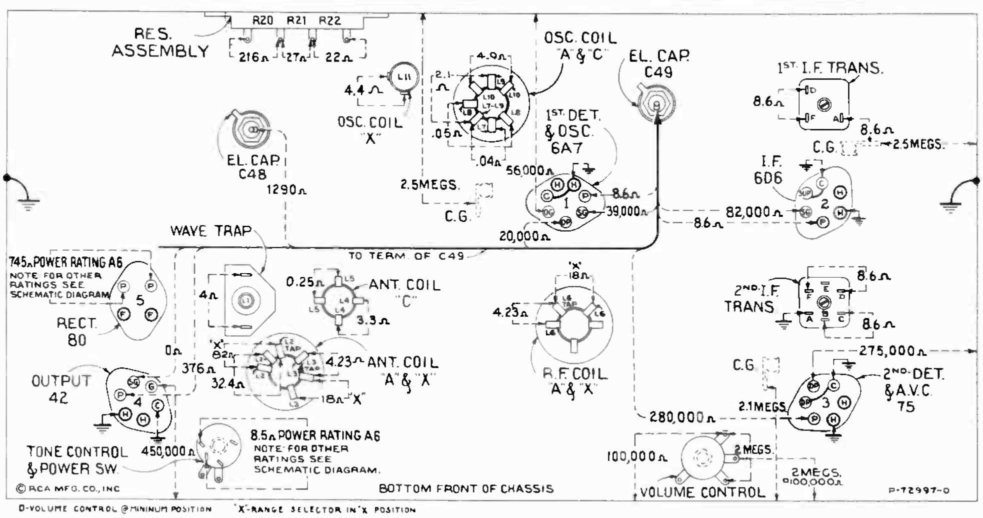


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—Volume control maximum—Range selector in "A" position

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis-ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

oscillator magnetite core screw **L10** (top of oscillator coil), simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum (peak) output results from the combined operations. After completing this adjustment, the trimmers **C25, C13** and **C4** should be re-adjusted as in (e) to correct for any change in the oscillator high-frequency tuning which has been caused by the preceding adjustment.

"X" Band

(g) Adjust receiver range selector to band "X" position and set receiver tuning control to a dial reading of **350 kc** or **857.14 meters (19.75** on "C" scale). Tune test oscillator to **350 kc** and adjust oscillator, detector, and antenna trimmers **C29, C15** and **C6,** respectively, for maximum indicated receiver output.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1) RCA-6A7—1st Det.—Osc.	12.4	ma.
(2) RCA-6D6—I. F. Amp.	10.2	ma.
(3) RCA-75—2nd Det., A.V.C. and A. F.	0.23	ma.
(4) RCA-42—Power Amp.	39	ma.
(5) RCA-80—Rectifier	64	ma.*

(*Cannot be measured at socket)

(h) Set receiver to **175 kc** or **1,714.28 meters (7.4** on "C" scale) and tune test oscillator to **175 kc.** Adjust screw **L11** for maximum indicated output, simultaneously rocking tuning control of the receiver backward and forward through the signal.

(i) The adjustment of **C29, C15** and **C6** should now be repeated at **350 kc** as described in (g) to compensate for any changes caused by the low-frequency adjustment **L11.**

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

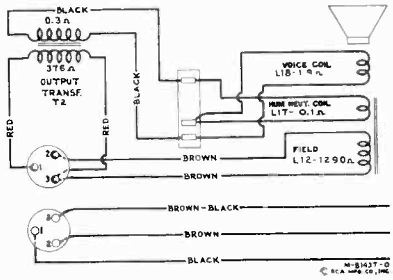


Figure 5—Loudspeaker Wiring

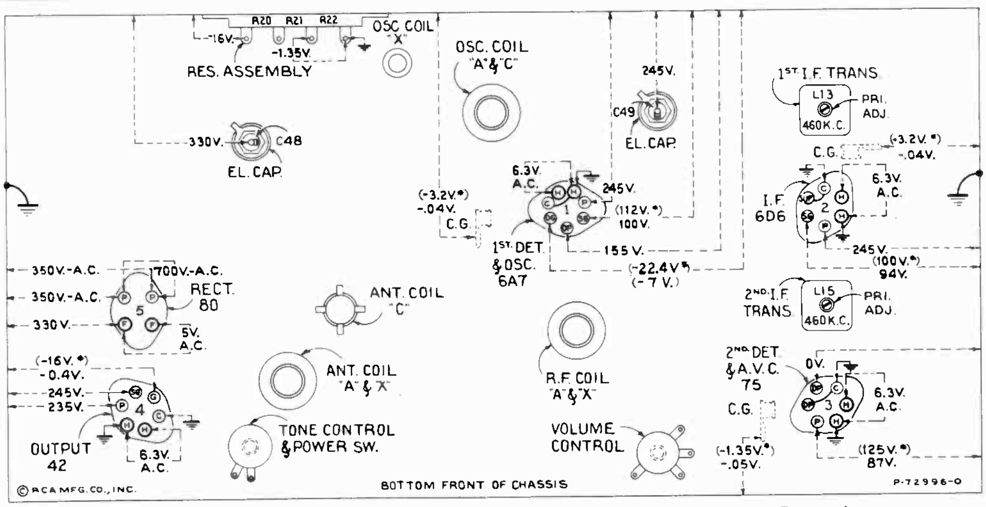


Figure 6—Radiotron Socket Voltages, Coil and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc or 300 meters "A" band—No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: ***Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.***

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis-ground on figure 6 will assist in locating cause of faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12806	Board—Antenna and ground terminal board	$0.25
12717	Board—Phonograph terminal board	.22
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12118	Cap—Grid contact cap—Package of 5	.15
12722	Capacitor—15 Mmfd. (C10, C14, C26)	.20
13605	Capacitor—27 Mmfd. (C7)	.25
12948	Capacitor—33 Mmfd. (C39)	.20
12813	Capacitor—82 Mmfd. (C19)	.20
13604	Capacitor—115 Mmfd. (C28)	.25
12724	Capacitor—120 Mmfd. (C43)	.28
12404	Capacitor—120 Mmfd. (C21, C22, C36, C37)	.26
12725	Capacitor—150 Mmfd. (C1)	.28
12406	Capacitor—180 Mmfd. (C38)	.26
13602	Capacitor—220 Mmfd. (C30)	.25
13603	Capacitor—470 Mmfd. (C27)	.25
13593	Capacitor—1,000 Mmfd. (C2, C3)	.25
12811	Capacitor—3,600 Mmfd. (C18, C24)	.35
4868	Capacitor—.005 Mfd. (C31)	.20
4838	Capacitor—.005 Mfd. (C46)	.20
5148	Capacitor—.007 Mfd. (C40)	.28
13138	Capacitor—.01 Mfd. (C42)	.25
4858	Capacitor—.01 Mfd. (C44)	.28
11315	Capacitor—.015 Mfd. (C47)	.20
13606	Capacitor—.025 Mfd. (C9)	.20
13607	Capacitor—.05 Mfd. (C8)	.20
4836	Capacitor—.05 Mfd. (C11)	.30
4841	Capacitor—0.1 Mfd. (C20, C34, C35)	.22
4840	Capacitor—0.25 Mfd. (C41)	.30
5170	Capacitor—0.25 Mfd. (C33)	.25
12741	Capacitor—0.5 Mfd. (C45)	.30
11240	Capacitor—10 Mfd. (C48)	1.08
5212	Capacitor—18 Mfd. (C32, C49)	1.16
12807	Capacitor—Trimmer capacitor (C23)	.35
12714	Capacitor—Trimmer capacitor (C12)	.38
12884	Capacitor—Trimmer capacitor (C4, C6, C13, C15, C25, C29)	.40
13587	Coil—Antenna coil and shield, X and A bands (L2, L3)	2.00
13589	Coil—Antenna coil, C band (L4, L5)	.55
12798	Coil—Oscillator coil and shield, A and C bands (L7, L8, L9, L10)	1.65
13590	Coil—Oscillator coil and shield, X band (L11)	.95
13588	Coil—R. F. coil and shield, X and A bands (L6)	1.45
13584	Condenser—3-gang variable tuning condenser (C5, C16, C17)	5.65
5119	Connector—3-contact female speaker cable connector	.25
11979	Connector—2-contact male connector for power cable, mounts on back of cabinet	.30
12006	Core—Adjustable core and stud for I. F. transformer, Stock Nos. 12652 and 12653	.22
12800	Core—Adjustable core and stud for Stock No. 12798	.20
12882	Core—Adjustable core and stud for Stock No. 13590	.20
12664	Core—Adjustable core and stud for wave-trap, Stock No. 13592	.22
13595	Dial—Station selector dial and mounting bracket assembly	1.00
12702	Drive—Vernier drive and pinion gear for variable condenser	.68
12712	Indicator—Station selector indicator pointer	.22
5226	Lamp—Dial lamp—Package of 5	.70
11324	Resistor—560 ohms, carbon type, ¼ watt—Package of 5 (R2)	1.00
3078	Resistor—10,000 ohms, carbon type, ½ watt—Package of 5 (R6, R7)	1.00
13594	Resistor—15,000 ohms, carbon type, 1/10 watt—Package of 5 (R1)	.75
3219	Resistor—18,000 ohms, carbon type, ½ watt—Package of 5 (R5)	1.00
11364	Resistor—33,000 ohms, carbon type, ¼ watt—Package of 5 (R14)	1.00
13206	Resistor—39,000 ohms, carbon type, 2 watts (R8)	.30
5029	Resistor—56,000 ohms, carbon type, ¼ watt—Package of 5 (R4)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R12)	.75
12333	Resistor—68,000 ohms, carbon type, ¼ watt—Package of 5 (R19)	1.00
8064	Resistor—82,000 ohms, carbon type, ½ watt—Package of 5 (R9)	1.00

Stock No.	DESCRIPTION	List Price
5145	Resistor—100,000 ohms, carbon type, ¼ watt—Package of 5 (R3, R15)	$1.00
11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R13)	.75
12199	Resistor—270,000 ohms, insulated, ¼ watt—Package of 5 (R17)	1.00
11847	Resistor—390,000 ohms, carbon type, ¼ watt—Package of 5 (R19)	1.00
11626	Resistor—2.2 meg., carbon type, ¼ watt—Package of 5 (R10)	1.00
13601	Resistor—10 meg., insulated, ¼ watt—Package of 5 (R11)	1.00
12004	Resistor—Voltage divider resistor, comprising one 216-ohm, one 27-ohm and one 22-ohm sections (R20, R20, R22)	.45
12008	Shield—First or second I. F. transformer shield	.28
12607	Shield—First I. F. transformer shield top	.30
12581	Shield—Second I. F. transformer shield top	.36
4233	Shield—6D6 Radiotron shield	.22
3682	Shield—6A7 or 75 Radiotron shield	.22
11383	Shield—42 Radiotron shield	.20
13591	Shield—Chassis bottom shield and mounting foot assembly	1.30
12710	Shield—Coil shield for Stock Nos. 13587 and 13588	.28
12799	Shield—Coil shield for Stock No. 12798	.15
12883	Shield—Coil shield for Stock No. 13590	.20
4794	Socket—4-contact 80 Radiotron socket	.15
4786	Socket—6-contact 6D6, 42 or 75 Radiotron socket	.15
4787	Socket—7-contact 6A7 Radiotron socket	.15
11199	Socket—Dial lamp socket	.14
12007	Spring—Retaining spring for core, Stock Nos. 12006, 12800, 12882, 12664—Package of 10	.36
13585	Switch—Range switch (S1, S2)	2.15
13586	Switch—Tone control and power switch (S3, S4)	1.20
12652	Transformer—First I. F. transformer (L13, L14, C21, C22)	1.60
13392	Transformer—Power transformer, 100-120 volts, 50-60 cycles (T1)	4.95
13566	Transformer—Power transformer, 100-120 volts, 25-50 cycles (T1)	4.08
13393	Transformer—Power transformer, 110 and 220 volts, 50-60 cycles (T1)	4.95
12653	Transformer—Second I. F. transformer (L15, L16, C36, C37, C38, R12, R13)	2.06
13592	Trap—Wave-trap complete (L1, C2, C3, R1)	1.60
13144	Volume control (R16)	1.00
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket	.18
12012	Coil—Field coil (L12)	1.85
11469	Coil—Neutralizing coil (L17)	.20
12642	Cone—Reproducer cone and dust cap (L18)	.94
5118	Connector—3-contact male speaker cable connector	.25
9699	Reproducer—Reproducer complete	6.38
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
11824	Connector—2-contact female power cord connector	.34
11823	Cord—Power cord and connector assembly	.65
12698	Escutcheon—Station selector escutcheon and crystal	1.02
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11582	Knob—Range switch knob—Package of 5	.50
11347	Knob—Volume control or tone control and power switch knob—Package of 5	.75
11210	Screw—Chassis mounting screw assembly, comprising one screw, one washer and one lockwasher—Package of 4	.28
11349	Spring—Retaining spring for knob, Stock Nos. 11347, 11582, 12700—Package of 5	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50

First Edition

Prices quoted above are subject to change without notice.

RCA VICTOR MODEL 5T5

Five-Tube, Two-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard broadcast" (A) .... 530-1,900 kc
"Short wave" (C) .... 5,800-21,600 kc

ALIGNMENT FREQUENCIES
"Standard broadcast" (A) .... 600 kc (osc.), 1,700 kc (osc., ant.)
"Short wave" (C) .... 20,000 kc

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-6A7 .... First Det.—Oscillator
(2) RCA-6D6 .... Intermediate Amplifier
(3) RCA-75 .. Second Det., A-F Amp. and A.V.C.
(4) RCA-42 .... Audio Power Amplifier
(5) RCA-80 .... Full-Wave Rectifier

Pilot Lamp (1) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS
Rating A .... 105-125 volts, 50-60 cycles, 75 watts
Rating B .... 105-125 volts, 25-60 cycles, 75 watts
Rating C .... 100-125/200-250 volts, 50-60 cycles, 75 watts

POWER OUTPUT RATING
Undistorted .... 2.0 watts
Maximum .... 4.5 watts

LOUDSPEAKER
Type .... Electrodynamic
Voice Coil Impedance .... 2.2 ohms at 400 cycles

Mechanical Specifications

Height .... 19½ inches
Width .... 13⅜ inches
Depth .... 8½ inches
Weight (Net) .... 24 pounds
Weight (Shipping) .... 29 pounds
Chassis Base Dimensions .... 12 inches x 7 inches x 3 inches
Over-all Chassis Height .... 7¾ inches
Operating Controls .... (1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch–Tone
Tuning Drive Ratio .... 10 to 1 and 50 to 1

General Features

This receiver is of the superheterodyne type and has many distinctive features. Its design includes magnetite core adjusted i-f transformers and wave-trap, aural compensated volume control, tone control, resistance-coupled audio system, phonograph terminal board, and an 8-inch dust-proof electrodynamic loud-speaker.

Tuning range includes the "Standard broadcast" (A) and "Short wave" (C) bands. The "Short wave" (C) position of this extensive range includes channels assigned for amateur, and international short-wave broadcast on 49, 31, 25, 19, 16 and 13 meters. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of 10 to 1, with a 50 to 1 vernier, permits ease of tuning, especially in the "Short wave" band.

Circuit Arrangement

The first-detector and oscillator functions are accomplished in a single tube, an RCA-6A7. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (magnetite core adjusted) wave-trap is connected across the primary of this transformer to prevent signals of intermediate frequency (460 kc) from being introduced into the first stage as interference. A two-section gang condenser tunes the antenna transformer secondary and the heterodyne oscillator coils. These coils are

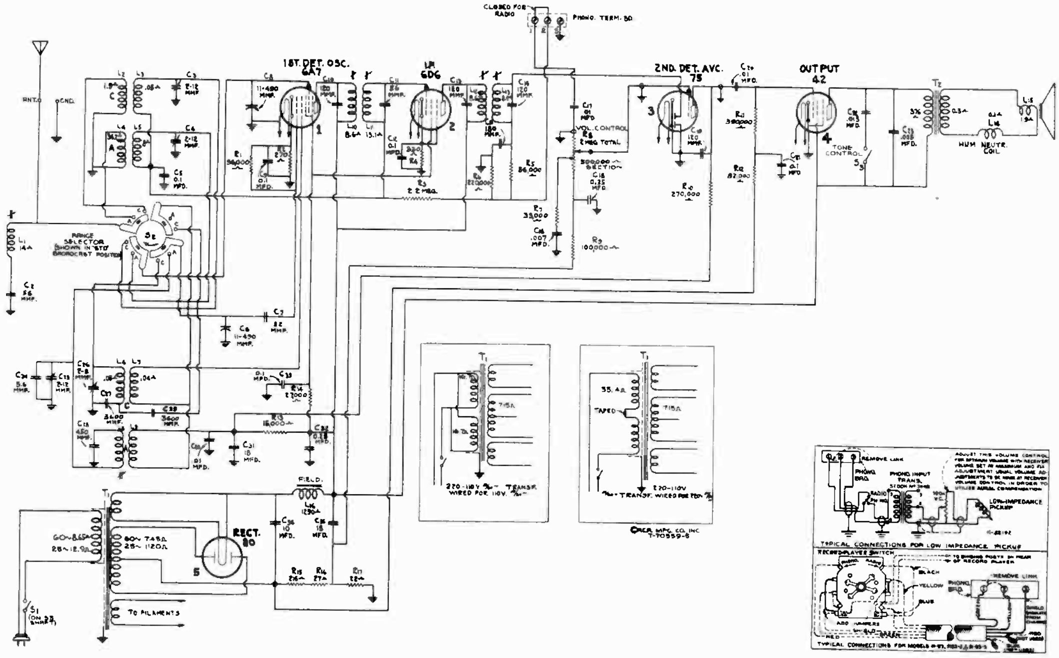


Figure 1—Schematic Wiring Diagram

L8, 4.9 ohms
L9, 2.1 ohms

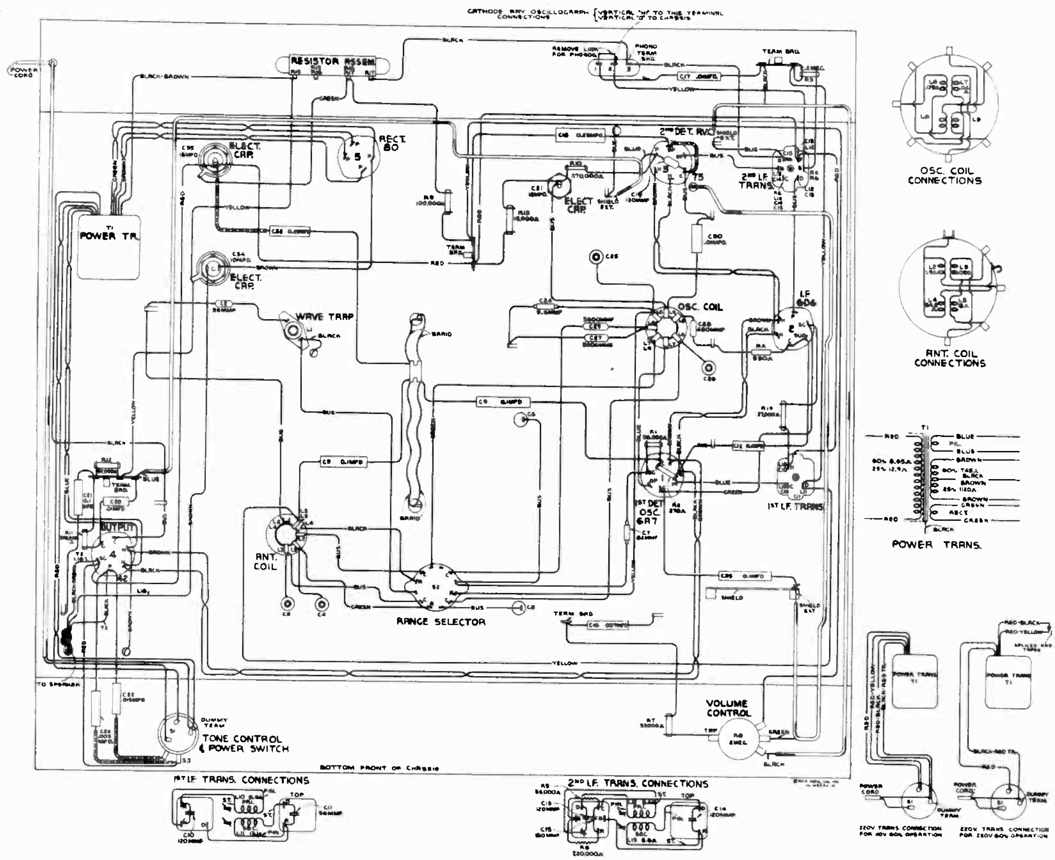


Figure 2—Chassis Wiring Diagram

shunted by improved plunger-type, air-dielectric, adjustable trimming capacitors, for obtaining exact alignment.

The intermediate frequency stage is coupled to the RCA-6A7 and to the RCA-75 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to **460 kc.**

The modulated signal as obtained from the output of the i-f system is detected by one of the diodes of the RCA-75 tube. Audio frequency secured by this process is passed on to the control grid of this same tube for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R6, is applied as automatic control grid bias to the first-detector and i-f tubes through a suitable resistance filter.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-75, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-42 power output stage, which, in turn, is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch S3.

The power supply system consists of an RCA-80 rectifier tube, power transformer, and filter.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1,

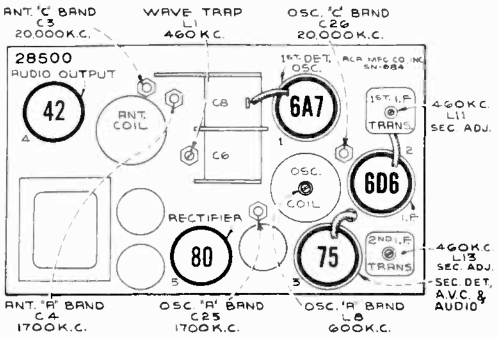


Figure 3—Radiotron, Coil, and Trimmer Locations

etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are five alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer and wave-trap adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available for sale, through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595,** is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 6. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil.

Connect the output of the test oscillator to the control grid of the RCA-6A7 through a **.001 mfd.** capacitor. Connect the test oscillator **"Gnd"** terminal to the ground terminal of the receiver chassis. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered from local broadcast stations or from the local (heterodyne) oscillator. To eliminate signals from the local oscillator short stator of C6 to chassis-ground. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust the two magnetite core screws of the second i-f transformer **L13** and **L12** to produce maximum (peak) indicated receiver output. Then adjust the two magnetite core screws **L11** and **L10** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme end calibration mark (beyond 55 on dial) while the two-gang tuning condenser plates are in full mesh.

Wave-Trap Adjustment

Attach the output of the test oscillator to the receiver "Antenna" terminal through a **200 mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator tuned to **460 kc.** Adjust range selector to "Short wave" (C) position. Then adjust the wave-trap screw to the point which causes maximum suppression (minimum received) of the 460 kc signal.

"Standard Broadcast" Band

(a) Adjust range selector to "Standard broadcast" (A) position. Reduce output of test oscillator to a minimum. Tune the test oscillator to **600 kc** and set receiver dial pointer to **600 kc.** Adjust output of test oscillator until a slight indication of output is visible.

(b) Adjust the oscillator magnetite core screw **L8** (top of oscillator coil) so that maximum (peak) indicated output results.

(c) Set receiver dial pointer to **1,700 kc.** Tune the test oscillator to **1,700 kc.** Carefully adjust the oscillator and antenna trimmers **C25** and **C4** respectively so that each brings about maximum (peak) indicated output.

(d) Tune the test oscillator to **600 kc.** Adjust the receiver to pick up this signal disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L8** (top of oscillator coil) for maximum (peak) output while rocking gang tuning condenser. After completing this adjustment, the trimmers **C25** and **C4** should be re-adjusted as in (c) to correct for any change in the oscillator high-frequency tuning which has been caused by the preceding adjustment.

"Short-Wave" Band

(e) Connect the "Ant." output of the test oscillator to the "Antenna" terminal through a **300-ohm** resistor, leaving the "Gnd." of the oscillator connected to the receiver chassis.

(f) Adjust range selector to its "Short wave" (C) position. Set receiver dial pointer to **20,000 kc.**

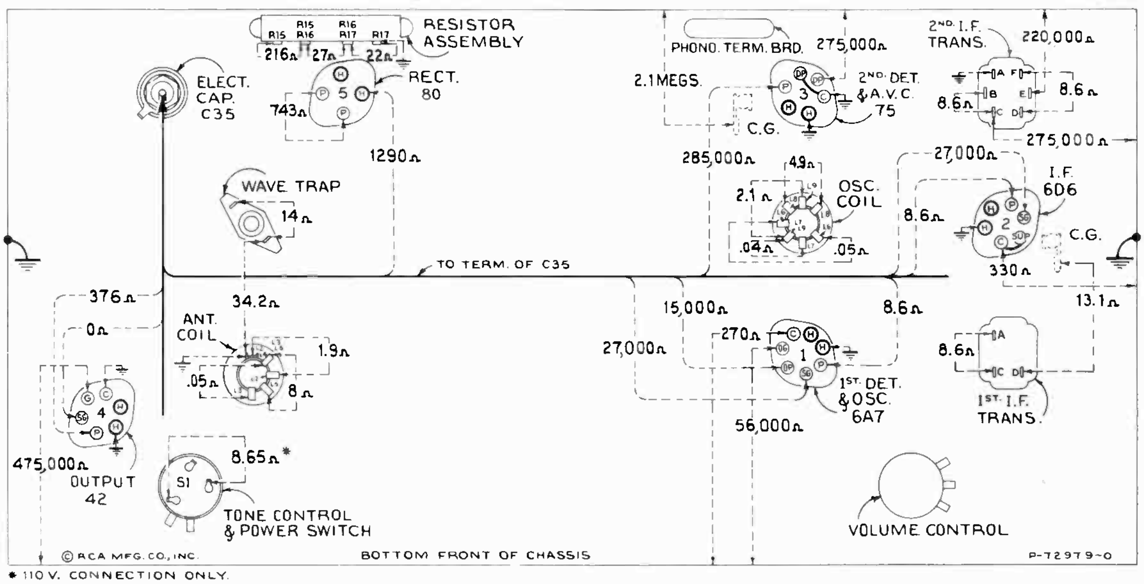


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis-ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

Tune test oscillator to **20,000 kc.** Set oscillator trimmer **C26** to minimum capacity (plunger full out), and antenna trimmer **C3** to maximum capacity (plunger full in). Slowly push in oscillator trimmer **C26** until maximum (peak) output is reached. Two peaks may be found. Adjust **C26** to the peak with minimum capacity (plunger near out) for maximum indication. Tighten lock nut. Slowly pull out plunger of antenna trimmer **C3** until maximum (peak) indicated output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut.

Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube Socket Plate Terminals Under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6A7—1st Det.—Osc.	11.0 ma.
(2)	RCA-6D6—I. F. Amp.	10.0 ma.
(3)	RCA-75—2nd Det., A.V.C. and A. F.	0.22 ma.
(4)	RCA-42—Power Amp.	42.0 ma.
(5)	RCA-80—Rectifier	—

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

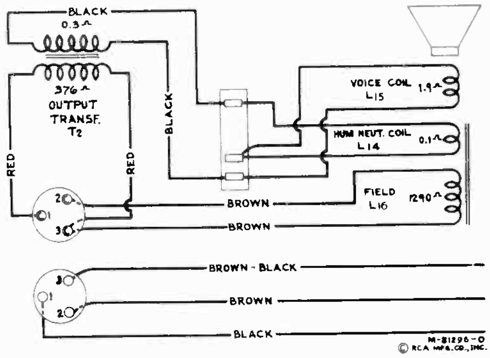


Figure 5—Loudspeaker Wiring

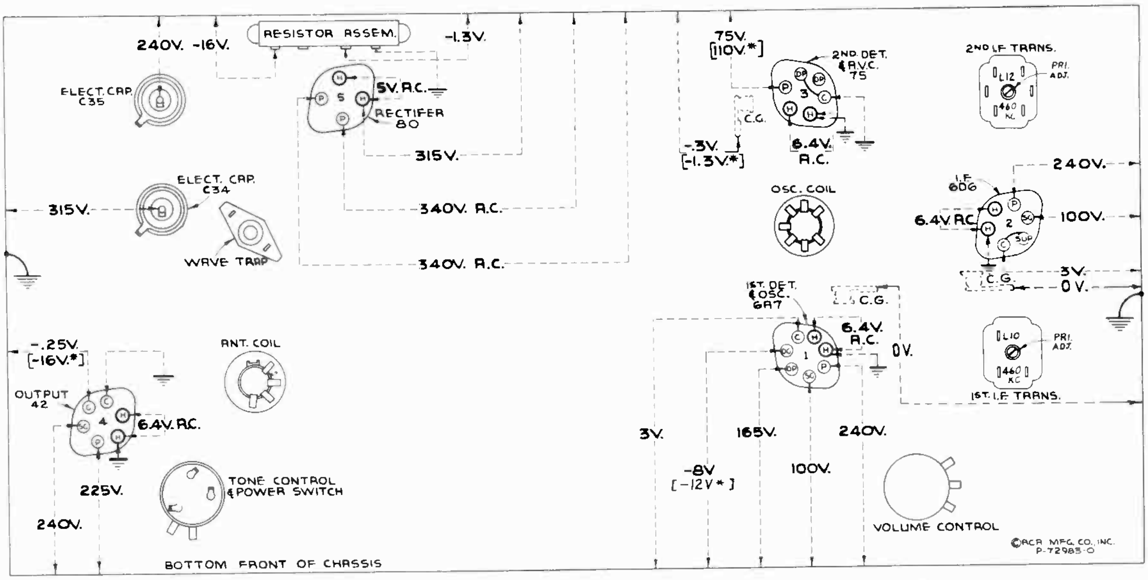


Figure 6—Radiotron Socket Voltages, Coil and Trimmer Locations.

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc ("Standard broadcast")—No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 6 will assist in locating cause of faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
13216	Board—Antenna and ground terminal board	$0.25
12717	Board—Phonograph terminal board	.22
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12118	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer (C3, C4, C25)	.38
12807	Capacitor—Adjustable trimmer (C26)	.35
12973	Capacitor—5.6 Mmfd. (C24)	.20
12723	Capacitor—56 Mmfd. (C2)	.20
12629	Capacitor—56 Mmfd. (C11)	.20
13394	Capacitor—82 Mmfd. (C7)	.20
12724	Capacitor—120 Mmfd. (C19)	.28
12404	Capacitor—120 Mmfd. (C10, C13, C14)	.26
12406	Capacitor—180 Mmfd. (C15)	.26
12812	Capacitor—450 Mmfd. (C28)	.25
12811	Capacitor—3,600 Mmfd. (C27, C29)	.35
4868	Capacitor—.005 Mfd. (C23)	.20
5148	Capacitor—.007 Mfd. (C16)	.20
11315	Capacitor—.015 Mfd. (C22)	.20
4858	Capacitor—.01 Mfd. (C17, C20, C30)	.25
4840	Capacitor—0.25 Mfd. (C18)	.30
5170	Capacitor—0.25 Mfd. (C32)	.25
4841	Capacitor—0.1 Mfd. (C5, C9, C12, C21, C33)	.22
11240	Capacitor—10 Mfd. (C34)	1.08
5212	Capacitor—18 Mfd. (C31, C35)	1.16
12797	Coil—Antenna coil and shield (L2, L3, L4, L5)	1.30
12798	Coil—Oscillator coil and shield (L6, L7, L8, L9)	1.65
12701	Condenser—2-gang variable tuning condenser (C6, C8)	4.00
5119	Connector—3-contact female connector for speaker cable	.25
12006	Core—Adjustable core and stud for Stock Nos. 12653 and 12801	.22
12664	Core—Adjustable core and stud for Stock No. 12654	.22
13313	Dial—Station selector dial	.45
12702	Drive—Vernier drive for variable condenser	.68
13314	Indicator—Station selector indicator pointer	.15
5226	Lamp—Dial lamp, 6.3 volts—Package of 5	.70
13310	Resistor—Voltage divider comprising one 216-ohm, one 27-ohm and one 22-ohm sections (R15, R16, R17)	.55
6135	Resistor—270 ohms, carbon type, ¼ watt watt—Package of 5 (R2)	1.00
11296	Resistor—330 ohms, carbon type, ¼ watt —Package of 5 (R4)	1.00
12759	Resistor—15,000 ohms, carbon type, ½ watt—Package of 5 (R13)	1.00
12011	Resistor—27,000 ohms, carbon type, 1 watt—Package of 5 (R14)	1.10
11364	Resistor—33,000 ohms, carbon type, ¼ watt—Package of 5 (R7)	1.00
5029	Resistor—56,000 ohms, carbon type, ¼ watt—Package of 5 (R1)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R5)	.75
11365	Resistor—82,000 ohms, carbon type, ¼ watt—Package of 5 (R12)	1.00
5145	Resistor—100,000 ohms, carbon type, ¼ watt—Package of 5 (R9)	1.00
11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R6)	.75
11323	Resistor—270,000 ohms, carbon type, ¼ watt—Package of 5 (R10)	$1.00
11847	Resistor—390,000 ohms, carbon type, ¼ watt—Package of 5 (R11)	1.00
11626	Resistor—2.2 meg., carbon type, ¼ watt —Package of 5 (R3)	1.00
12651	Shield—Antenna coil shield	.22
13311	Shield—Chassis end shield and rubber mounting foot assembly—Package of 2	.80
12607	Shield—First I. F. transformer shield top	.30
12008	Shield—I. F. transformer shield	.28
12799	Shield—Oscillator coil shield	.15
12581	Shield—Second I. F. transformer shield top	.36
3682	Shield—6A7 or 75 Radiotron shield	.22
3950	Shield—6D6 Radiotron shield	.26
4794	Socket—4-contact 80 Radiotron socket	.15
4786	Socket—6-contact 6D6, 42 or 75 Radiotron socket	.15
4787	Socket—7-contact 6A7 Radiotron socket	.15
11199	Socket—Dial lamp socket	.14
12007	Spring—Retaining spring for Stock Nos. 12006 and 12664—Package of 10	.36
12796	Switch—Range switch (S2)	1.00
13309	Switch—Tone control and power switch (S1, S3)	.55
12801	Transformer—First I. F. transformer complete (L10, L11, C10, C11)	1.70
12653	Transformer—Second I. F. transformer complete (L12, L13, C13, C14, C15, R5, R6)	2.06
13392	Transformer—Power transformer, 105-125 volts, 50-60 cycles (T1)	4.95
13566	Transformer—Power transformer, 105-125 volts, 25-60 cycles (T1)	4.80
13393	Transformer—Power transformer, 110 and 220 volts, 50-60 cycles (T1)	4.95
12654	Trap—Wave-trap complete (L1)	.75
13144	Volume control (R8)	1.00
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket	.18
12012	Coil—Field coil (L16)	1.85
11469	Coil—Neutralizing coil (L14)	.20
12642	Cone—Reproducer cone and dust cap (L15)	.94
5118	Connector—3-contact male speaker cable connector	.25
9699	Reproducer—Complete	6.38
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
12785	Crystal—Station selector escutcheon and crystal	1.00
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11347	Knob—Volume control, tone control or range switch knob—Package of 5	.75
11377	Screw—Chassis mounting screw and washer assembly—Package of 4	.12
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12700—Package of 5	.25

First Edition.

Prices quoted above are subject to change without notice.

RCA VICTOR MODEL 5U

Five-Tube, Two-Band, A-C, Radio—Phonograph

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Standard broadcast" (A) .... 530-1,900 kc
"Short wave" (C) .... 5,800-21,600 kc

ALIGNMENT FREQUENCIES

"Standard broadcast" (A) .... 600 kc (osc.), 1,700 kc (osc., ant.)
"Short wave" (C) .... 20,000 kc

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6A7 .... First Det.—Oscillator
(2) RCA-6D6 .... Intermediate Amplifier
(3) RCA-75 .. Second Det., A-F Amp. and A.V.C.
(4) RCA-42 .... Audio Power Amplifier
(5) RCA-80 .... Full-Wave Rectifier

Pilot Lamp (1) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A-6 .... 105-125 volts, 60 cycles, 80 watts
Rating A-5 .... 105-125 volts, 50 cycles, 80 watts
Rating B-2 .... 105-125 volts, 25 cycles, 80 watts
Rating C-6 .... 105-125/200-250 volts, 60 cycles, 80 watts
Rating C-5 .... 105-125/200-250 volts, 50 cycles, 80 watts

POWER OUTPUT

Undistorted .... 2.0 watts
Maximum .... 4.5 watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (v.c.) .... 2.2 ohms at 400 cycles

PHONOGRAPH

Type .... Manual
Turntable Speed .... 78 r.p.m.

Type of Pickup .... Low-impedance magnetic
Pickup Impedance .... 96 ohms at 1,000 cycles

Mechanical Specifications

Height .... $21\frac{5}{8}$ inches
Width .... $16\frac{3}{8}$ inches
Depth .... $14\frac{11}{16}$ inches
Weight (net) .... 44 pounds
Weight (shipping) .... 56 pounds
Chassis Base Dimensions .... 12 inches x 7 inches x 3 inches
Over-all Chassis Height .... $7\frac{3}{4}$ inches
Operating Control .. (1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch–Tone, (5) Radio–Phono
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

The Model 5U combination instrument consists of a five-tube radio receiver and a manually-operated phonograph combined in one cabinet. Its design includes magnetite core adjusted i-f transformers and wave-trap, aural compensated volume control, tone control, resistance-coupled audio system, synchronous phonograph motor, and an 8-inch dust-proof electrodynamic loudspeaker.

Tuning range includes the "Standard broadcast" (A) and "Short wave" (C) bands. The "Short wave" (C) position of this extensive range includes channels assigned for amateur, and international

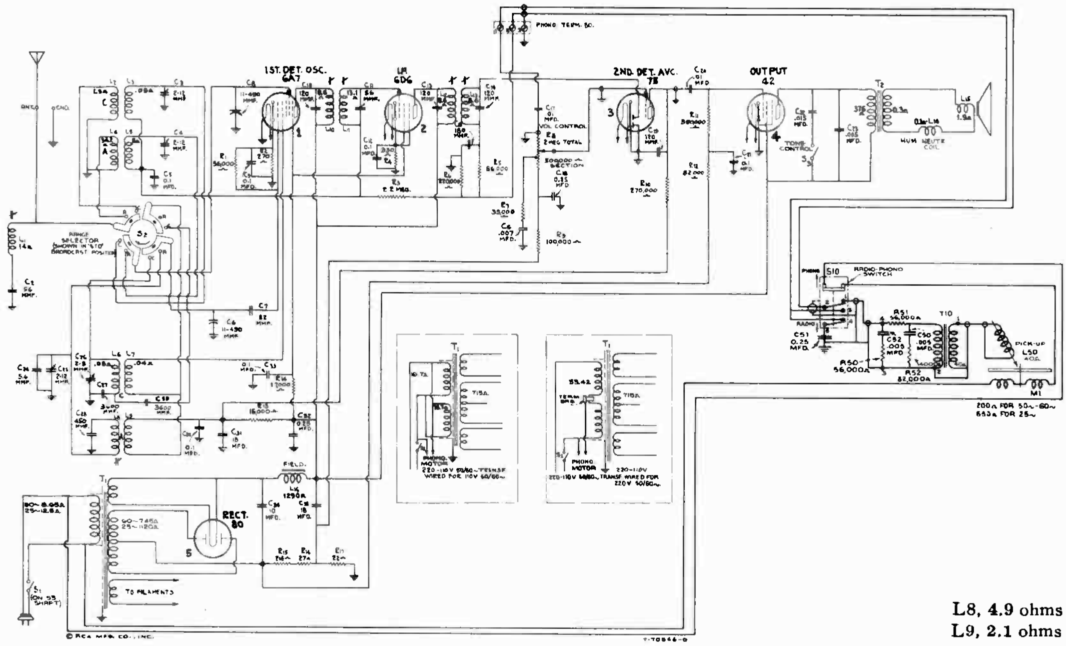


Figure 1—Schematic Circuit Diagram

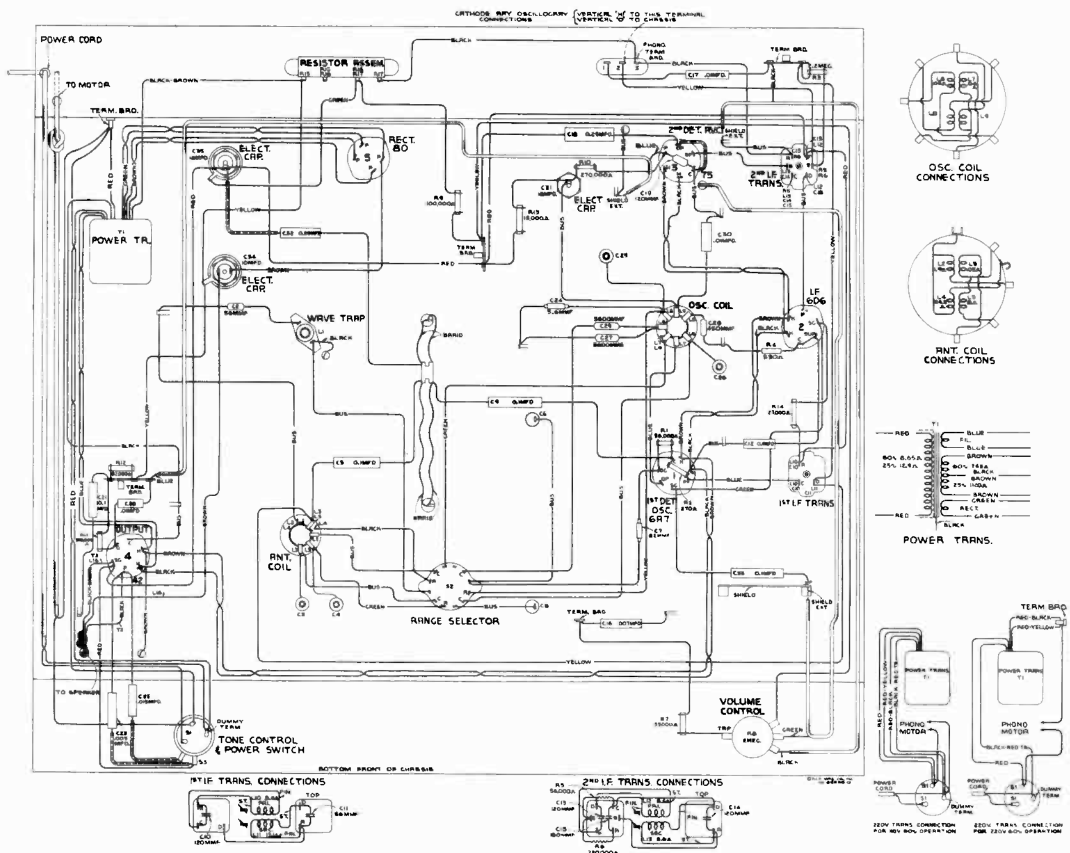


Figure 2—Chassis Wiring Diagram

short-wave broadcast on 49, 31, 25, 19, 16 and 13 meters. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of 10 to 1, with a 50 to 1 vernier, permits ease of tuning, especially in the "Short wave" band.

Circuit Arrangement

The first-detector and oscillator functions are accomplished in a single tube, an RCA-6A7. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (magnetite core adjusted) wave-trap is connected across the primary of this transformer to prevent signals of intermediate frequency (**460 kc**) from being introduced into the first stage as interference. A two-section gang con-

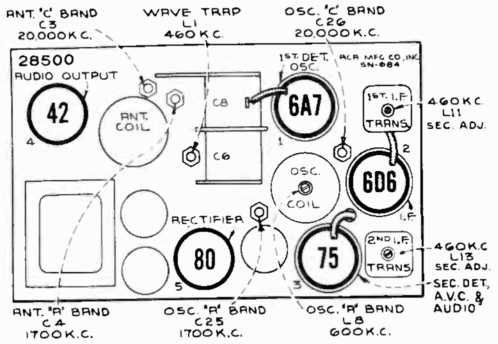


Figure 3—Radiotron, Coil, and Trimmer Locations

denser tunes the antenna transformer secondary and the heterodyne oscillator coils. These coils are shunted by improved plunger-type, air-dielectric, adjustable trimming capacitors, for obtaining exact alignment.

The intermediate frequency stage is coupled to the RCA-6A7 and to the RCA-75 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to **460 kc.**

The modulated signal as obtained from the output of the i-f system is detected by one of the diodes of the RCA-75 tube. Audio frequency secured by this process is passed on to the control grid of this same tube for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R6, is applied as automatic control grid bias to the first-detector and i-f tubes through a suitable resistance filter.

A radio-phono switch S10 is provided to connect either the output of the second detector, or the output of the phonograph input transformer, to the first audio control grid through the coupling capacitor C17 and the acoustically-tapered potentiometer R8. Capacitor C51 is used to bypass any audio components in the second detector when S10 is thrown to "Phonograph" position. Transformer T10 serves to boost the electrical impulses generated in the phonograph pickup coil L50. A compensation filter is placed in shunt with the output of T10 to correct the frequency response of the reproducing system so as to compensate for phonograph recording characteristics. After amplification by the RCA-75, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-42 power output stage, which, in turn, is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch S3.

The power supply system consists of an RCA-80 rectifier tube, power transformer, and filter.

The phonograph mechanism is of the manually operated type, having a synchronous motor which rotates the turntable at a speed of 78 r.p.m. The 10-inch turntable will accommodate either the 10-inch or 12-inch phonograph records. The pickup mechanism and tone arm are combined as one unit. The instrument may be purchased with any one of five ratings as specified under Electrical Specifications. *It is important that a machine of any particular rating be operated at the frequency and voltage for which it is rated.* Attempts to operate at ratings other than specified for the particular instrument will result in improper reproduction from the phonograph and may result in damage to both the phonograph motor and radio receiver.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as L1, C2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are five alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer and wave-trap adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available for sale, through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595,** is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

During alignment, the Radio–Phono control should be thrown to "Radio" position. The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 6. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil.

Connect the output of the test oscillator to the control grid of the RCA-6A7 through a **.001 mfd.** capacitor. Connect the test oscillator **"Gnd"** terminal

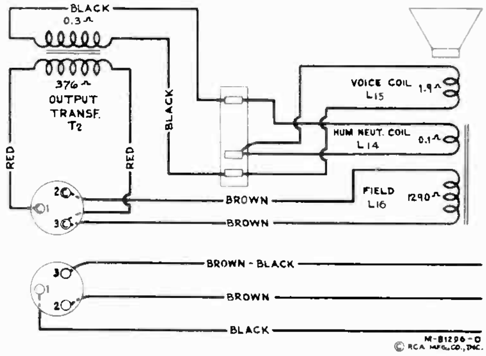


Figure 4—Loudspeaker Wiring

to the ground terminal of the receiver chassis. Tune the oscillator to **460 kc.** Advance the receiver volume

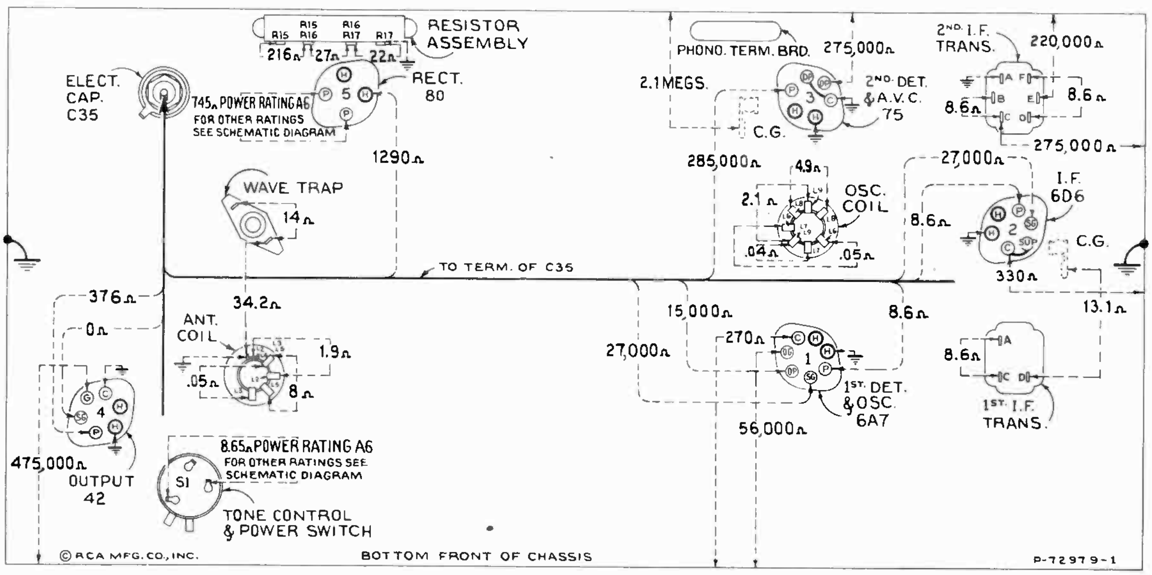


Figure 5—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—
Range selector "Standard broadcast"—Radio–Phono "Radio"—
Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis-ground or other pertinent point on figure 5, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered from local broadcast stations or from the local (heterodyne) oscillator. To eliminate signals from the local oscillator short stator of C6 to chassis-ground. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust the two magnetite core screws of the second i-f transformer L13 and L12 to produce maximum (peak) indicated receiver output.

Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube Socket Plate Terminals Under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6A7—1st Det.—Osc.	11	ma.
(2)	RCA-6D6—I. F. Amp.	10	ma.
(3)	RCA-75—2nd Det., A.V.C. and A. F.	0.22	ma.
(4)	RCA-42—Power Amp.	42	ma.
(5)	RCA-80—Rectifier	63	ma.*

(*Cannot be measured at socket.)

Then adjust the two magnetite core screws L11 and L10 of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment. Remove temporary chassis-ground jumper from stator of C6.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme end calibration mark (beyond 55 on dial) while the two-gang tuning condenser plates are in full mesh.

Wave-Trap Adjustment

Attach the output of the test oscillator to the receiver "Antenna" terminal through a **200 mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator tuned to **460 kc.** Adjust range selector to "Short wave" (C) position. Then adjust the wave-trap screw to the point which causes maximum suppression (minimum received) of the **460 kc** signal.

"Standard Broadcast" Band

(a) Adjust range selector to "Standard broadcast" (A) position. Reduce output of test oscillator to a minimum. Tune the test oscillator to **600 kc**

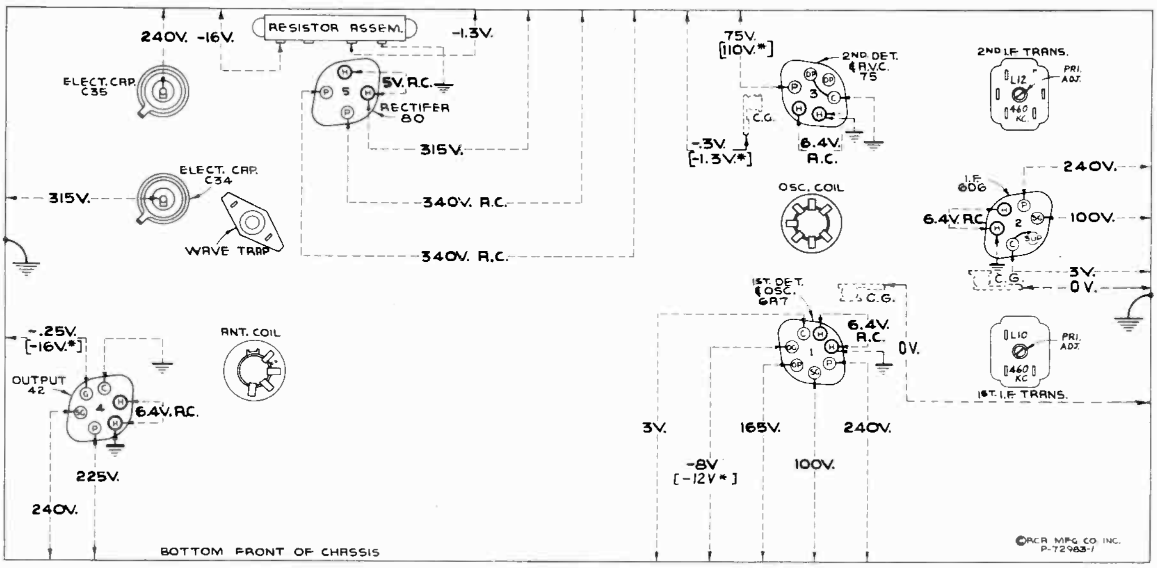


Figure 6—Radiotron Socket Voltages, Coil and Trimmer Locations.

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc ("Standard broadcast")—Radio-Phono "Radio"—No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 6 will assist in locating cause of faulty operation. Each value as specified should hold within $\pm$ 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

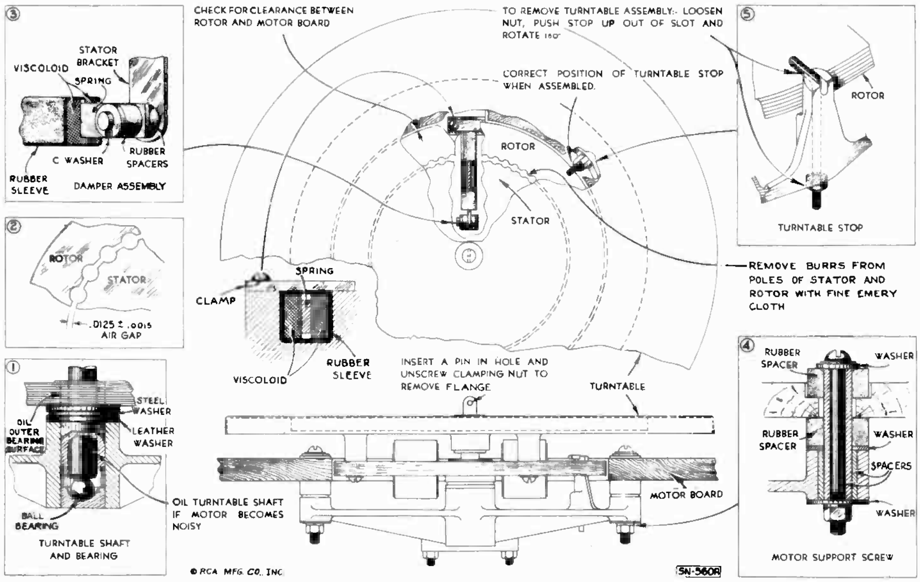


Figure 7—Details of Motor

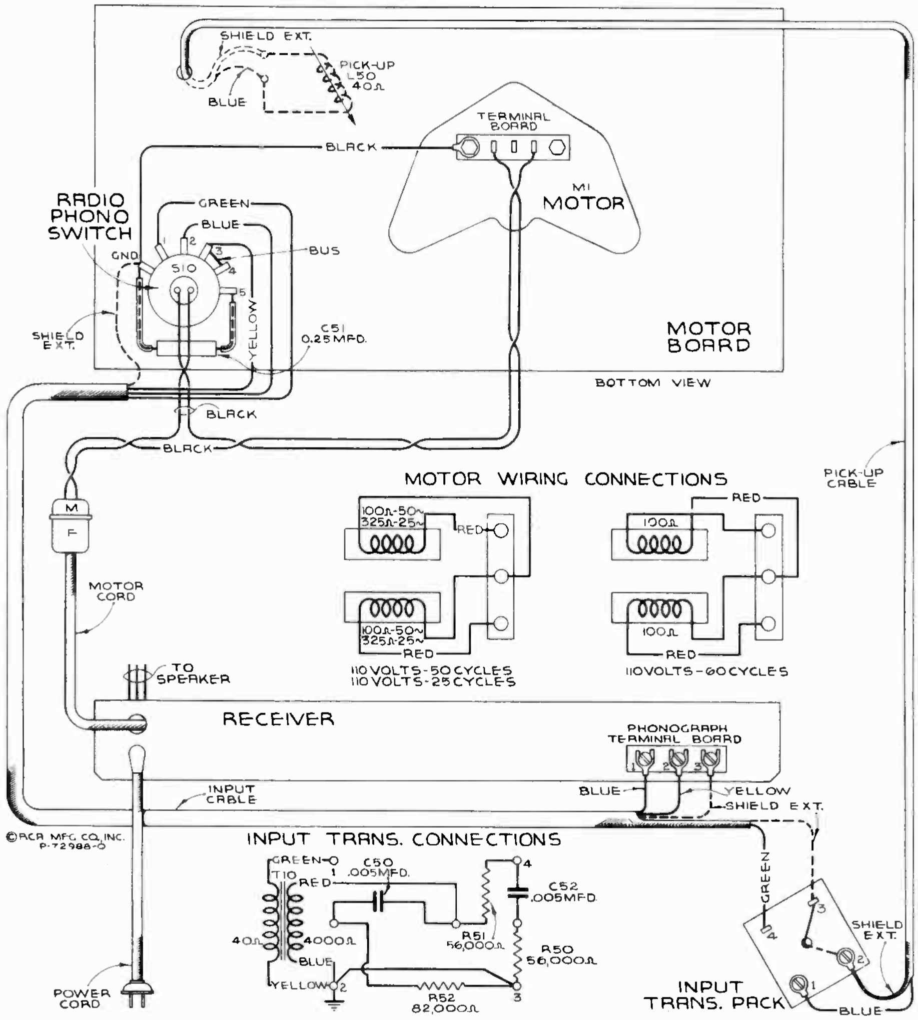


Figure 8—Assembly Wiring

If hum occurs during phonograph reproduction, a Stock No. 12037 should be connected between terminals 3 and 4 of input transformer.

and set receiver dial pointer to **600 kc.** Adjust output of test oscillator until a slight indication of output is visible.

(b) Adjust the oscillator magnetite core screw **L8** (top of oscillator coil) so that maximum (peak) indicated output results.

(c) Set receiver dial pointer to **1,700 kc.** Tune the test oscillator to **1,700 kc.** Carefully adjust the oscillator and antenna trimmers **C25** and **C4** respectively so that each brings about maximum (peak) indicated output.

(d) Tune the test oscillator to **600 kc.** Adjust the receiver to pick up this signal disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L8** (top of oscillator coil) for maximum (peak) output while rocking gang tuning condenser. After completing this adjustment, the trimmers **C25** and **C4** should be re-adjusted as in (c) to correct for any change in the oscillator high-frequency tuning which has been caused by the preceding adjustment.

"Short-Wave" Band

(e) Connect the "Ant." output of the test oscillator to the "Antenna" terminal through a **300-ohm** resistor, leaving the "Gnd." of the oscillator connected to the receiver chassis.

(f) Adjust range selector to its "Short wave" (C) position. Set receiver dial pointer to **20,000 kc.** Tune test oscillator to **20,000 kc.** Set oscillator trimmer **C26** to minimum capacity (plunger full out), and antenna trimmer **C3** to maximum capacity (plunger full in). Slowly push in oscillator trimmer **C26** until maximum (peak) output is reached. Two peaks may be found. Adjust **C26** to the peak with minimum capacity (plunger near out) for maximum indication. Tighten lock nut. Slowly pull out plunger of antenna trimmer **C3** until maximum (peak) indicated output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut.

Phonograph Mechanism

The phonograph motor is of the synchronous type and designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 7.

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

Centering Armature

Refer to figure 9 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i. e., exactly centered. Whenever this centering adjustment has been disturbed it will be necessary to remove the pickup mechanism from the tone arm by removing the needle holding screw and the two mounting screws from the front of the tone arm, holding the pickup assembly to keep it from dropping. Unsolder the two leads from the lugs on the terminal board at the rear of the pickup. Insert a small rod or nail into the armature needle hole and replace the needle holding screw, tightening

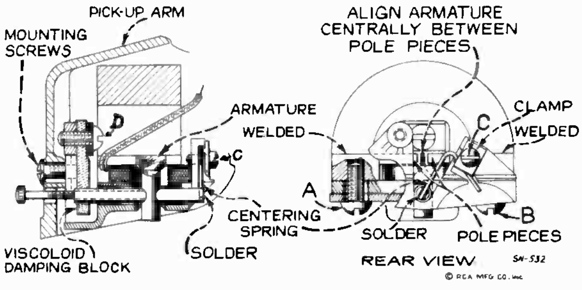


Figure 9—Details of Pickup

it to hold the rod securely. If the armature clamping screws A and B have not been disturbed, screw C should be loosened which will permit the armature to be moved from side to side, the rod acting as a lever to perform this operation. The proper adjustment is obtained when the armature is moved to the extreme position on each side (the movement being limited by the armature striking the pole pieces) and then brought to the mid position between these two extremes. Screw C should then be tightened. The armature position should then be central between the pole pieces and at right angles to them. With a little practice, the correct adjustment of the armature will be obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other foreign material which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid damping block which is attached to the front end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, the pickup mechanism should be removed from the tone arm as explained above. Unsolder the pickup coil leads from the two lugs on the pickup terminal board and remove the terminal board mounting screw and the terminal board. Then remove screw D and the damping block from the pickup assembly. Make sure that the shaft of the armature which contacts the viscoloid is clean. Then insert the new damping block so that it occupies the same position as that of the original block, and is in correct vertical alignment with the armature. The hole in the block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the damping block properly aligned on the armature, screw D with its washer should then be replaced. Heat should be applied to the armature (viscoloid side) so that the damping block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron, constructed as shown in figure 10, will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block, causing a small bulge on both sides.

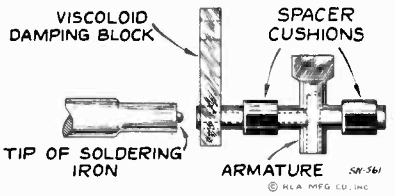


Figure 10—Special Soldering-Iron Tip

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. Remove the pickup mechanism and terminal board as described above. Remove screws A and B and the magnet assembly. Remove the bakelite coil support (with coil attached) and insert the new coil support assembly in its place, after which replace the magnet assembly and center the armature as described above, then re-assemble the remainder of the unit. Only rosin core solder should be used for soldering the coil leads and pickup leads to the pickup terminal board. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to remagnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to remagnetize it so that the same polarity is maintained.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
13216	Board—Antenna and ground terminal board	$0.25
12717	Board—Phonograph terminal board	.22
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12118	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer (C3, C4, C25)	.38
12807	Capacitor—Adjustable trimmer (C26)	.35
12973	Capacitor—5.6 Mmfd. (C24)	.20
12723	Capacitor—56 Mmfd. (C2)	.20
12629	Capacitor—56 Mmfd. (C11)	.20
13394	Capacitor—82 Mmfd. (C7)	.20
12724	Capacitor—120 Mmfd. (C19)	.28
12404	Capacitor—120 Mmfd. (C10. C13, C14)	.26
12406	Capacitor—180 Mmfd. (C15)	.26
12812	Capacitor—450 Mmfd. (C28)	.25
12811	Capacitor—3.600 Mmfd. (C27, C29)	.35
4868	Capacitor—.005 Mfd. (C23)	.20
5148	Capacitor—.007 Mfd. (C16)	.20
11315	Capacitor—.015 Mfd. (C22)	.20
4858	Capacitor—.01 Mfd. (C17, C20, C30)	.25
4840	Capacitor—0.25 Mfd. (C18)	.30
5170	Capacitor—0.25 Mfd. (C32)	.25
4841	Capacitor—0.1 Mfd. (C5, C9, C12, C21, C33)	.22
11240	Capacitor—10 Mfd. (C34)	1.08
5212	Capacitor—18 Mfd. (C31, C35)	1.16
12797	Coil—Antenna coil and shield (L2, L3, L4, L5)	$1.30
12798	Coil—Oscillator coil and shield (L6, L7, L8, L9)	1.65
12701	Condenser—2-gang variable tuning condenser (C6, C8)	4.00
5119	Connector—3-contact female connector for speaker cable	.25
12006	Core—Adjustable core and stud for Stock Nos. 12653 and 12801	.22
12664	Core—Adjustable core and stud for Stock No. 12654	.22
13313	Dial—Station selector dial	.45
12702	Drive—Vernier drive for variable condenser	.68
13314	Indicator—Station selector indicator pointer	.15
5226	Lamp—Dial lamp, 6.3 volts—Package of 5	.70
13310	Resistor—Voltage divider comprising one 216-ohm, one 27-ohm and one 22-ohm sections (R15, R16, R17)	.55
6135	Resistor—270 ohms, carbon type, 1/4 watt —Package of 5 (R2)	1.00
11296	Resistor—330 ohms, carbon type, 1/4 watt —Package of 5 (R4)	1.00
12759	Resistor—15,000 ohms, carbon type, 1/2 watt—Package of 5 (R13)	1.00
12011	Resistor—27.000 ohms, carbon type, 1 watt—Package of 5 (R14)	1.10

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
11364	Resistor—33,000 ohms, carbon type, ¼ watt—Package of 5 (R7)	$1.00
5029	Resistor—56,000 ohms, carbon type, ¼ watt—Package of 5 (R1)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R5)	.75
11365	Resistor—82,000 ohms, carbon type, ¼ watt—Package of 5 (R12)	1.00
5145	Resistor—100,000 ohms, carbon type, ¼ watt—Package of 5 (R9)	1.00
11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R6)	.75
11323	Resistor—270,000 ohms, carbon type, ¼ watt—Package of 5 (R10)	1.00
11847	Resistor—390,000 ohms, carbon type, ¼ watt—Package of 5 (R11)	1.00
11626	Resistor—2.2 meg., carbon type, ¼ watt—Package of 5 (R3)	1.00
12651	Shield—Antenna coil shield	.22
13311	Shield—Chassis end shield and rubber mounting foot assembly—Package of 2	.80
12607	Shield—First I. F. transformer shield top	.30
12008	Shield—I. F. transformer shield	.28
12799	Shield—Oscillator coil shield	.15
12581	Shield—Second I. F. transformer shield top	.36
3682	Shield—6A7 or 75 Radiotron shield	.22
3950	Shield—6D6 Radiotron shield	.26
4794	Socket—4-contact 80 Radiotron socket	.15
4786	Socket—6-contact 6D6, 42 or 75 Radiotron socket	.15
4787	Socket—7-contact 6A7 Radiotron socket	.15
11199	Socket—Dial lamp socket	.14
12007	Spring—Retaining spring for Stock Nos. 12006 and 12664—Package of 10	.36
12796	Switch—Range switch (S2)	1.00
13309	Switch—Tone control and power switch (S1, S3)	.55
12801	Transformer—First I. F. transformer complete (L10, L11, C10. C11)	1.70
12653	Transformer—Second I. F. transformer complete (L12, L13, C13, C14, C15, R5, R6)	2.06
13392	Transformer—Power transformer, 105-125 volts, 50-60 cycles (T1)	4.95
13566	Transformer—Power transformer, 105-125 volts, 25-50 cycles (T1)	4.80
13393	Transformer—Power transformer, 110 and 220 volts, 50-60 cycles (T1)	4.95
12654	Trap—Wave-trap complete (L1)	.75
13144	Volume control (R8)	1.00
	MOTOR ASSEMBLIES	
10194	Ball—Steel ball bearing—Package of 20	.25
11740	Base—Motor base and bearing assembly	1.45
11733	Coil—Stator assembly, comprising coil and laminations, 105-125-volt, 60-cycle operation	2.96
11734	Coil—Stator assembly, comprising coil and laminations, 105-125-volt, 50-cycle operation	3.08
11735	Coil—Stator assembly, comprising coil and laminations, 105-125-volt, 25-cycle operation	3.08
13081	Coil—Stator coil assembly, comprising coil and laminations, 200-250-volt, 50-cycle operation	4.60
11748	Damper—Motor damper assembly, comprising one damper, one damper plate, one screw, two rubber washers and one "C" washer	.20
12082	Motor—105-125-volt, 60-cycle motor (M1)	11.10
12083	Motor—105-125-volt, 50-cycle motor (M1)	$11.10
9733	Motor—105-125-volt, 25-cycle motor (M1)	11.00
9734	Motor—200-250-volt, 50-cycle motor (M1)	10.50
4456	Motor accessories—Comprising three nuts, one shield and one screw	.10
12048	Turntable—Turntable assembly complete with rotor laminations, 60-cycle operation	4.80
13084	Turntable—Turntable assembly complete with rotor laminations—25-cycle operation	5.45
12049	Turntable—Turntable assembly compelte with rotor laminations, 50-cycle operation	4.80
4083	Washer—Leather washer—Package of 10	.20
4084	Washer—Metal washer—Package of 10	.26
	PICKUP AND ARM ASSEMBLIES	
3812	Armature—Pickup armature (L50)	.32
13568	Coil—Pickup coil	.60
4543	Damper—Damper block complete with damper clamp, washer	.10
13567	Pickup and arm assembly complete	7.10
3811	Screw—Needle holding screw—Package of 10	.46
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket	.18
12012	Coil—Field coil (L16)	1.85
11469	Coil—Neutralizing coil (L14)	.20
12642	Cone—Reproducer cone and dust cap (L15)	.94
5118	Connector—3-contact male speaker cable connector	.25
9699	Reproducer—Complete	6.38
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
13564	Cable—3-conductor shielded input cable, approximately 32½ inches long, connects receiver to radio-record switch	.50
4840	Capacitor—0.25 Mfd. (C51)	.30
12785	Crystal—Station selector escutcheon and crystal	1.00
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11347	Knob—Volume control, tone control, range switch or radio-record switch knob—Package of 5	.75
11377	Screw—Chassis mounting screw assembly, comprising one screw, one washer and one lockwasher—Package of 4	.12
11869	Screw—Motor mounting screw assembly, comprising one screw, three metal washers, two rubber washers, one lockwasher, two spacers and one nut—Package of 3	.32
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12700—Package of 5	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
13563	Switch—Radio-record switch (S10)	1.05
13565	Transformer—Phonograph input transformer (T10, C50, C52, R50, R51, R52)	2.95

Prices quoted above are subject to change without notice.

SUPPLEMENT TO

RCA VICTOR MODEL 5X

Late production Model 5X instruments incorporate a few minor changes from the original Model 5X. These changes are: (1) a fixed tuned wave-trap used in place of the adjustable wave-trap; and (2) a few component part changes as listed below. All Specifications and Service Data for Model 5X are directly applicable to these instruments except, under "Alignment procedure", omit the wave-trap adjustment. Visual inspection of the wave-trap will readily identify these instruments.

REPLACEMENT PARTS

Stock No.	Description
11414	Capacitor--0.1 Mfd. (C19)
13837	Capacitor pack--Comprising one 10Mfd. and two 16 Mfd. sections (C23, C24, C26)
12695	Resistor--15,000 ohms, insulated, 1/4 watt (R2)
12679	Resistor--2.2 megohms, insulated, 1/4 watt (R3, R7)
13836	Switch--Range switch (S2, S3, S4, S5)
13838	Trap--Wave trap (L1, C1)
13149	Coil--Reproducer field coil (L13, L15)

Stock Nos. 12537, 4835, 12398, 12410, 12411, 12399, 3404, 12402, 12395, 12497, 12499, 12731, 12498, 9684, 12500, 13150, 13071, 12936, and 12937 are not used in Model 5X with fixed wave-trap.

RCA VICTOR MODELS 5X, 5X3, and 5X4

Five-Tube, Two-Band, AC-DC, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges

"Standard Broadcast" (A) .... 540-1,800 kc.
"Short Wave" (B) .... 1,800-6,500 kc.

Alignment Frequencies

"Standard Broadcast" (A) 600 kc. (osc.); 1,700 kc. (osc. and ant.)
"Short Wave" (B) .... None required

Intermediate Frequency .... 460 kc.

Radiotron Complement

(1) RCA-6A7 .... First Detector–Oscillator
(2) RCA-78 .... Intermediate Amplifier
(3) RCA-75 .... Second Detector, A-F, and A.V.C.
(4) RCA-43 .... Power Output
(5) RCA-25Z5 .... Rectifier

Power Supply Rating (105-125 volts) .... 50-60 cycles—60 watts, D-C—50 watts

Power Output

Undistorted .... 0.4 watts AC, 0.3 watts DC
Maximum .... 0.9 watts AC, 0.8 watts DC

Loudspeaker

Type .... Electrodynamic
Impedance (v.c.) {M80864-1, 4.5 ohms; M80864-2, 3.0 ohms} at 400 cycles

Pilot Lamps (2) .... Mazda No. 40, 6.3 volts, 0.15 amperes

Mechanical Specifications

Cabinet Dimensions	Model 5X	Model 5X3	Model 5X4
Height	$9\frac{3}{8}$ inches	$9\frac{5}{8}$ inches	$7\frac{5}{8}$ inches
Width	$12\frac{5}{16}$ inches	$10\frac{3}{8}$ inches	$10\frac{5}{8}$ inches
Depth	6 inches	6 inches	6 inches
Weights			
Net	11 pounds	$10\frac{1}{2}$ pounds	$9\frac{3}{4}$ pounds
Shipping	$13\frac{1}{2}$ pounds	$13\frac{1}{2}$ pounds	$12\frac{3}{4}$ pounds

Chassis Base Dimensions .... $9\frac{1}{8}$ inches x $4\frac{3}{4}$ inches x $1\frac{7}{8}$ inches
Over-all Height of Chassis .... $6\frac{1}{8}$ inches
Tuning Drive Ratio .... 5 to 1
Operating Controls .... (1) Power Switch–Volume, (2) Tuning, (3) Range Selector

General Features

Each model contains a five-tube chassis mounted in a table-type cabinet. The superheterodyne type of circuit is used, with such features of design as: automatic volume control, diode detection, magnetite core adjusted i-f transformers, improved core adjusted antenna wave-trap, band-selective illumination of full vision dial scales, five to one tuning ratio, resistance coupled audio system and an electrodynamic loudspeaker. The tuning range is continuous through the "Standard broadcast" and "Short wave" bands (including 49 meters). The short-wave portion of this extensive range also includes channels assigned for police, amateur and aviation communication. Trimmer adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. A mechanical interlock switch, in the power supply circuit, is provided on some models to prevent accidental shocks and damage to equipment from operating the receiver with the rear cover removed.

Circuit Arrangement

The conventional superheterodyne type of circuit, consisting of a combined first-detector–oscillator stage, a single i-f stage, a diode-detector–automatic-volume-control stage, an audio voltage amplifier stage, an audio power output stage, and a half-wave rectifier power supply stage, is used.

Tuned Circuits

The antenna coil system consists of two series-connected primary and two series-connected secondary windings to provide the two ranges of tuning. The oscillator coil is similarly wound on a single form.

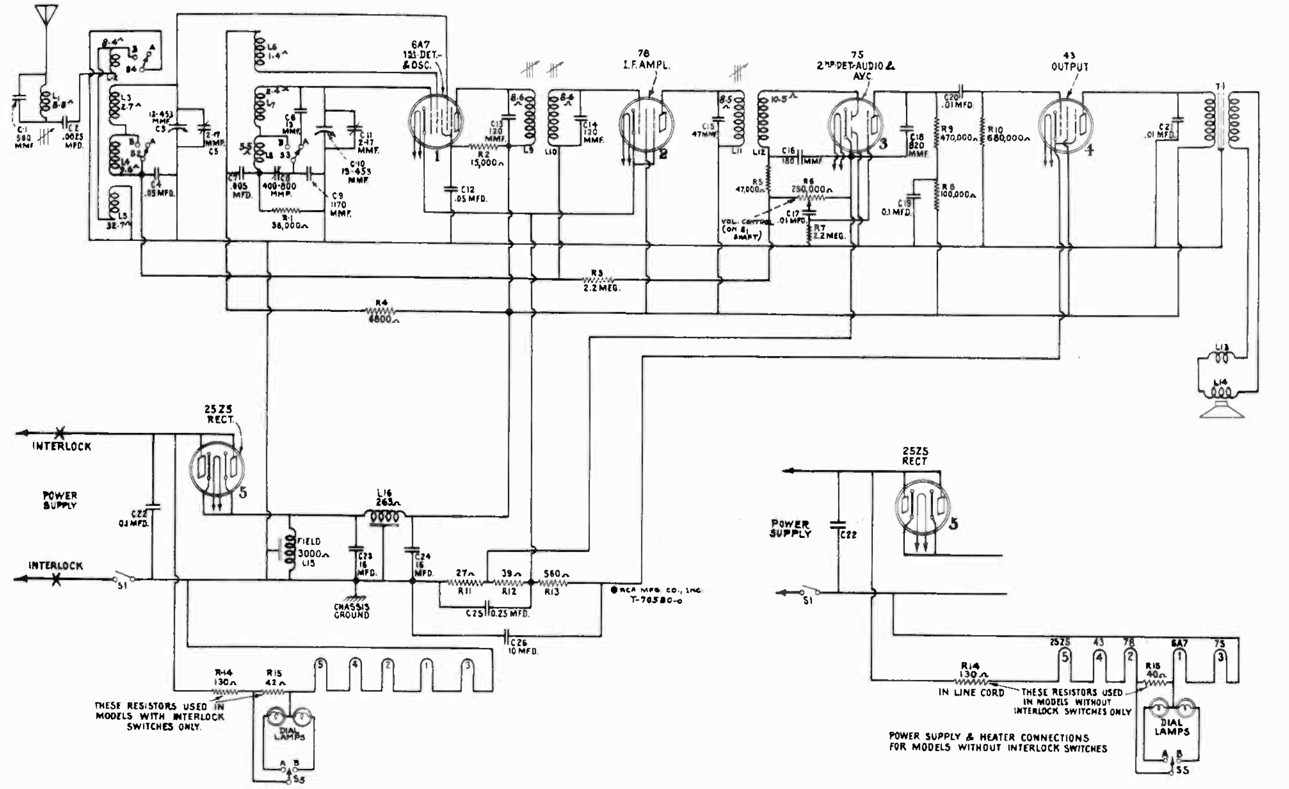


Figure 1—Schematic Circuit Diagram

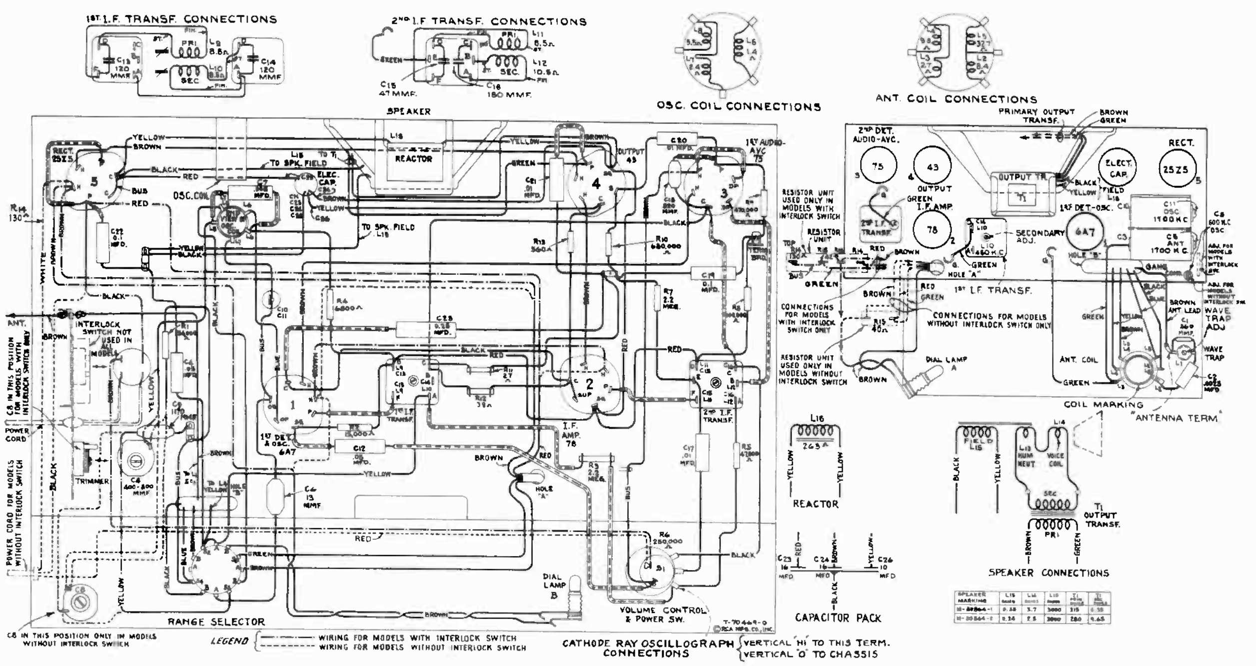


Figure 2—Chassis Wiring Diagram, Radiotron, Coil, and Trimmer Locations

A range selector switch, consisting of S2, S3, S4, and S5, is used to connect the various sections of these coil systems and to illuminate the proper dial scale for the band in operation. The coils are tuned by a variable two-section gang condenser having trimming capacitors in shunt with each section. A series trimming capacitor is also associated with the "Standard broadcast" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-78 in a transformer coupled circuit. This stage operates at a basic frequency of 460 kc. Adjustable magnetite cores are provided for adjusting inductance of the input i-f transformer (primary and secondary) and the output transformer (primary) windings.

Detector and A. V. C.

The modulated signal, as obtained from the output of the i-f stage is detected by one of the diodes in the RCA-75 tube. The audio frequency component, secured by this process, is transferred from the movable arm of the volume control R6 through coupling capacitor C17 to the control grid of the RCA-75 for voltage amplification. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage which develops across resistor R6 is applied as automatic control grid bias to the first-detector and i-f tube through a suitable resistance filter circuit.

Audio System

The audio frequency component, mentioned under "Detection and a.v.c.," transferred to the control grid of the RCA-75, is amplified in the tube and then coupled to the control grid of the power output tube RCA-43 through capacitor C20. The output of the power amplifier is transformer coupled into the dynamic loudspeaker.

Rectifier

The plate, grid, cathode and the loudspeaker field voltages required for the operation of this receiver are supplied by the RCA-25Z5 tube operating as a half-wave rectifier.

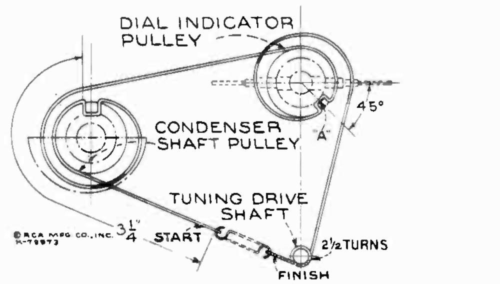


Figure 3—Tuning Drive Cord Mechanism

Rear view of drive assembly showing threading of drive cord with variable condenser plates in full mesh. To perform this operation, unsolder the four leads (connected between antenna coil and range selector switch) from the range selector switch, unsolder antenna lead-in wire from wave-trap terminal, unsolder lead from rear section of gang tuning condenser, and remove the four screws which secure the tuning drive frame to the chassis proper. This frame with gang tuning condenser still attached may now be easily removed for the threading operation. The relative position of the parts and method of threading are shown on the above diagram. In case the cord is too long for proper tension, it may be effectively shortened by first releasing finish end of cord, inserting a match or other shim under the cord at point "A" and then re-hooking the end of the cord to the tension spring. Replace drive assembly and re-solder leads.

SERVICE DATA

Caution: *Certain tests (e. g. alignment and voltage measurement) require operation of receiver with the chassis removed from the cabinet. To permit such operation on models using interlock switch, it will be necessary to hold the interlock switch (see figure 5) closed either by inserting a screwdriver, rod, or pencil through the small interlock hole at rear of chassis, or by temporarily unhooking the interlock tension spring and pushing the interlock bar towards the front of the chassis.* ***Avoid external grounding of receiver or associated equipment*** *since the power supply is connected to the receiver chassis. Carelessness may cause serious damage to equipment.* ***Replace interlock tension spring upon completion of test.***

Alignment Procedure

There are three alignment trimmers provided in the antenna coil and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of three screws attached to molded magnetite cores. Re-adjustment may occasionally occur from continued extremes of climate, tampering, purported alteration for services, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as the **RCA Stock No. 9595** will be required as the source of the signal at the specified alignment frequencies. Visual indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Output Indicator** is especially suitable for this use.

The procedure outlined below should be followed in adjusting the various trimming capacitors and molded magnetite cores:

I-F Core Adjustments

The three adjustment screws (one on top and one on bottom of first i-f transformer and one on bottom of second i-f transformer) are located as shown by figures 2 and 5. Each circuit must be aligned to a basic frequency of **460 kc.** To do this attach the output indicator across the loudspeaker voice coil or across the output transformer primary. Connect the output of the test oscillator through a **.05 mfd.** capacitor to the RCA-6A7 control grid, the ground of the test oscillator being connected to the receiver chassis through a **.05 mfd.** capacitor. Set the test oscillator to **460 kc.** Set the range selector to "Short-wave" position. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator.

Adjust the bottom core screw of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the two core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device.

During these adjustments regulate the test oscillator output so the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f core screws to assure that the interaction between them has not disturbed the original adjustment.

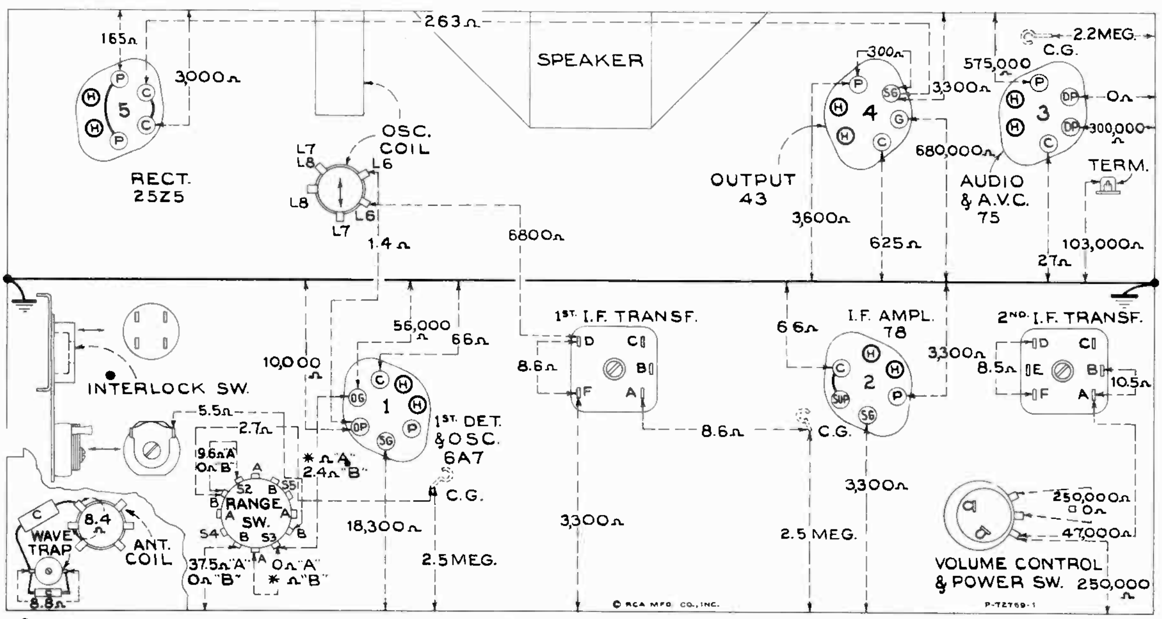
Wave-Trap Adjustment

Attach the output of the test oscillator to the "Antenna Terminal" (see wave-trap, top view chassis, figure 2) through an **80 mmfd.** capacitor, the ground connection of the test oscillator and receiver chassis being connected through capacitor as before. **Receiver "Antenna Wire" should be reeled up for this and the following r-f adjustments.**

Leave the test oscillator adjusted to **460 kc.** and range selector in "Short wave" position as before. Then adjust the wave-trap trimmer to the point which causes **maximum suppression** of the **460 kc.** signal.

R-F Trimmer Adjustments

Roughly calibrate the tuning dial by setting the pointer to the bottom horizontal line at the low fre-



NOTE:-
□ VOLUME CONTROL-MIN. POSITION.
"A" RANGE SW. IN "STANDARD BROADCAST" POSITION.
"B" RANGE SW. IN "SHORT WAVE" POSITION.
✱ OPEN CIRCUIT (LEAKAGE OF ELECTROLYTIC CAPACITORS ONLY).

Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh
Range selector "Standard broadcast"—Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4 have been carefully selected so as to facilitate a rapid check of the circuit for defective parts, bad joints, etc. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and the Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which would otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. Resistance values were measured with the Radiotrons in sockets, power supply disconnected, tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative (−) terminal of the resistance meter to the chassis ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

quency end of the broadcast scale with the two-gang tuning condenser at its maximum capacity. The output indicator should be left connected to the output system. The connections for the test oscillator remain the same as for "Wave-trap" adjustment. Volume control should be in maximum position. Make sure range selector is set to "Standard broadcast."

Set oscillator and antenna trimming capacitors **C11** and **C5**, respectively, to a position near minimum capacitance (plates near out). Adjust the test oscillator to **1,700 kc.**

Tune the receiver to pick up this signal (near **1,700 kc.** on dial) for maximum response disregarding dial reading. Always keep test oscillator output as low as is possible and still obtain visual indication. Adjust trimming capacitors **C11** and **C5** so that each produces maximum (peak) receiver output, re-adjusting receiver tuning slightly if necessary, but using the minimum trimming capacitance possible to obtain peaks. Adjust the dial pointer (without disturbing gang tuning condenser) to a dial reading of **1,700 kc.** Shift the test oscillator to **600 kc.** Tune the receiver to receive the signal disregarding the dial reading at which it is best received. Then adjust the oscillator series capacitor, **C8**, simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at **1,700 kc.** should then be repeated to correct for any change which may have been caused by the oscillator series trimming capacitor adjustment.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

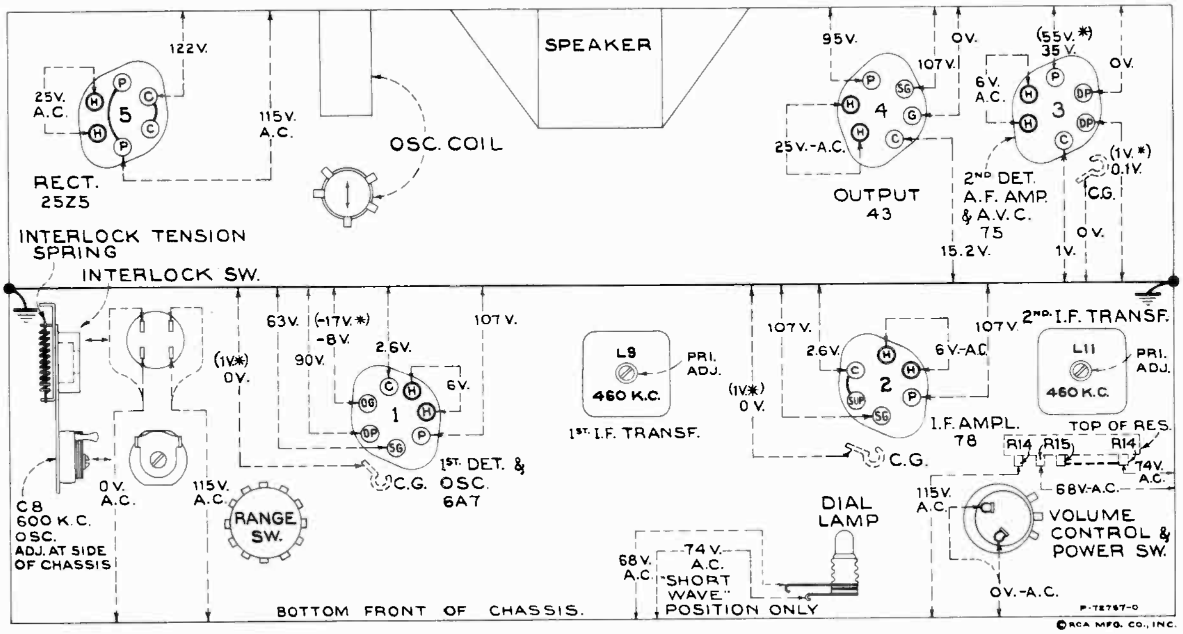


Figure 5—Radiotron Socket Voltages and Trimmer Locations

Measured at 115 volts, 60-cycle supply—For 115-volt d-c supply approximately 10% lower

Tuned to approximately 1,000 kc. ("Standard broadcast" range)—No signal being received—Volume control setting optional

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors and terminals to receiver chassis ground on figure 5 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 1,000 kc. ("Standard broadcast" range); no signal being received and volume control setting optional. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50 and 250 volts. Use nearest range above voltage to be measured. A-C voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
11409	Band—Tube shield rubber band—Package of 5	$0.10
12118	Cap—Grid contact cap—Package of 5	.15
11465	Capacitor—Adjustable capacitor (C8)	.48
12535	Capacitor—13 Mmfd. (C6)	.18
12405	Capacitor—47 Mmfd. (C15)	.26
12404	Capacitor—120 Mmfd. (C13, C14)	.26
12406	Capacitor—180 Mmfd. (C16)	.26
12537	Capacitor—560 Mmfd. (C1)	.20
12536	Capacitor—820 Mmfd. (C18)	.25
12534	Capacitor—1,170 Mmfd. (C9)	.28
5107	Capacitor—.0025 Mfd. (C2)	.16
4868	Capacitor—.005 Mfd. (C7)	.20
4858	Capacitor—.01 Mfd. (C17, C20, C21)	.25
4836	Capacitor—.05 Mfd. (C4)	.30
4886	Capacitor—.05 Mfd. (C12)	.20
4839	Capacitor—.1 Mfd. (C22)	.28
4835	Capacitor—.1 Mfd. (C19)	.28
4840	Capacitor—.25 Mfd. (C25)	.30
12398	Capacitor Pack—Comprising two 16 Mfd. and one 10 Mfd. section (C23, C24, C26)	2.72
4358	Clamp—Mounting clamp for capacitor Stock No. 12398	.15
12495	Coil—Antenna coil (L2, L3, L4, L5)	1.30
12496	Coil—Oscillator coil (L6, L7, L8)	.80
13128	Cord—Power cord (130 ohm resistor R14) (Models without interlock switch only)	1.00
12006	Core—Adjustable core for Stock Nos. 12403, 12407 and 12497	.22
4340	Lamp—Dial lamp—Package of 5	.60
12409	Lead — Antenna lead, approximately 20 feet long	.35
12397	Reactor—Filter reactor (L16)	1.14
12453	Resistor—27 ohm — insulated, ¼ watt (R11)—Package of 5	1.00
12415	Resistor—39 ohm — insulated, ¼ watt (R12)—Package of 5	1.00
12414	Resistor—560 ohm — insulated, ¼ watt (R13)—Package of 5	1.00
12265	Resistor—6,800 ohm—insulated, ¼ watt (R4)—Package of 5	1.00
12410	Resistor—15,000 ohm—insulated, ¼ watt (R2)—Package of 5	1.00
12412	Resistor—47,000 ohm—insulated, ¼ watt (R5)—Package of 5	1.00
12286	Resistor—56,000 ohm—insulated, ¼ watt (R1)—Package of 5	1.00
12263	Resistor—100,000 ohm—insulated, ¼ watt (R8)—Package of 5	1.00
12285	Resistor—470,000 ohm—insulated, ¼ watt (R9)—Package of 5	1.00
12413	Resistor—680,000 ohm—insulated, ¼ watt (R10)—Package of 5	1.00
12411	Resistor—2.2 megohm—insulated, ¼ watt (R3, R7)—Package of 5	1.00
12399	Resistor—Comprising one 130 ohm and one 42 ohm sections (R14, R15) (Models with interlock switch only)	1.40
12845	Resistor—40 ohm—wire wound (R15) (Models without interlock switch only)	.40
4786	Socket—6-contact 78, 75, 43 or 25Z5 Radiotron socket	.15
4787	Socket—7-contact 6A7 Radiotron socket	.15
12400	Socket—Dial lamp socket	.22
12008	Shield—First I.F. transformer shield	.28
12607	Shield—First I.F. transformer shield top	.30

Stock No.	Description	List Price
12408	Shield—Second I.F. transformer shield	.28
12396	Shield—75 or 78 Radiotron shield	.25
3404	Spring—Power switch spring—Package of 10	.50
12007	Spring—Retaining spring for core Stock No. 12006—Package of 10	.36
12402	Switch—Interlocking switch and cover	1.74
12395	Switch—Range switch (S2, S3, S4, S5)	.68
12403	Transformer—First intermediate frequency transformer, complete with shield (L9, L10, C13, C14)	1.62
12407	Transformer—Second intermediate frequency transformer, complete with shield (L11, L12, C15, C16)	1.45
12497	Trap—Wave trap (L1)	.70
12394	Volume Control — Volume control and power switch (R6, S1)	1.06
	REPRODUCER ASSEMBLIES (M80864-1)	
12499	Coil—Reproducer field coil (L15)	1.60
12731	Coil—Reproducer neutralizing coil (L13)	.22
12498	Cone—Reproducer cone, complete (L14)	1.20
9684	Reproducer—Speaker, complete	5.16
12500	Transformer—Output transformer (T1)	1.60
	REPRODUCER ASSEMBLIES (M80864-2)	
13149	Coil—Reproducer field coil (L13, L15)	1.60
13148	Cone—Reproducer cone, complete (L14)	1.25
9750	Reproducer—Speaker, complete	5.50
13151	Transformer—Output transformer (T1)	1.60
	DRIVE ASSEMBLIES	
12401	Condenser—2-gang variable tuning condenser (C3, C5, C10, C11)	2.35
12420	Cord—Variable tuning condenser drive cord—Package of 5	.20
12608	Dial—Dial scale—Used on Models 5X and 5X3 only	.45
13071	Dial—Dial scale — Used on Model 5X4 only	.45
12419	Indicator—Station selector indicator pointer	.15
12416	Pulley—Indicator pointer drive pulley and shaft	.24
12417	Pulley—Variable tuning condenser shaft pulley, with set screws	.24
12418	Screw—8-32x3/16 in. milled head, cupped point set screw for condenser drive pulley Stock No. 12417—Package of 10	.18
12422	Shaft—Variable tuning condenser drive (knob) shaft	.26
12421	Spring—Variable tuning condenser drive cord tension spring—Package of 10	.60
	MISCELLANEOUS ASSEMBLIES	
12548	Crystal—Station selector crystal and bezel —Used on Models 5X and 5X3 only	1.06
12936	Crystal—Station selector crystal and bezel —Used on Model 5X4 only	.90
12673	Knob—Station selector, volume control or range switch knob — Package of 5 — Used on Models 5X and 5X3 only	.58
12937	Knob—Station selector, volume control or range switch knob — Package of 5 — Used on Model 5X4 only	.65
4119	Screw—Set screw for knob Stock No. 12673 and 12937—Package of 20	.38

The prices quoted above are subject to change without notice.

First Edition

RCA VICTOR MODELS 5XA, 5XA3, and 5XA4

Five-Tube, Two-Band, AC-DC, Superheterodyne Receivers

TECHNICAL INFORMATION and SERVICE DATA

RCA Victor Models 5XA, 5XA3, and 5XA4 are similar to RCA Victor Models 5X, 5X3, and 5X4 respectively. Technical Information and Service Data for Models 5X, 5X3, and 5X4 is directly applicable except as contained herein.

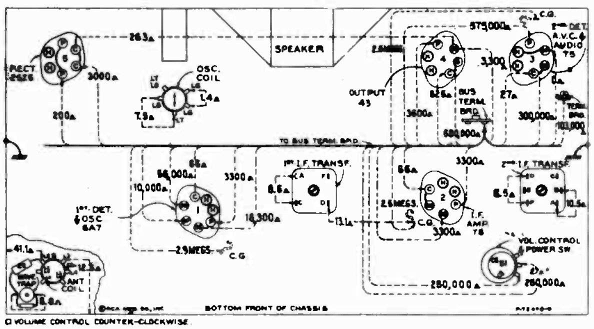


Figure 1—Resistance Diagram

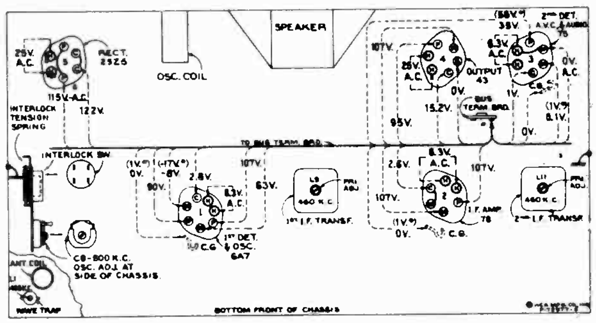


Figure 2—Voltage Diagram

The following parts listed for Models 5X, 5X3, and 5X4 are not required: Stock Nos. 13128, 12409, 13845, and 12403.

The following changes of, or additions to, the description of Stock Nos. of parts listed for Models 5X, 5X3, and 5X4 should be made: To Stock No. 12608 add Models 5XA and 5XA3, to Stock No. 13071 add Model 5XA4, to Stock No. 12548 add Models 5XA and 5XA3, to Stock No. 12936 add Model 5XA4, to Stock No. 12673 add Models 5XA and 5XA3, to Stock No. 12937 add Model 5XA4, to Stock No. 12006 add Stock No. 12801.

The parts listed below are required in addition to the remaining parts for Models 5X, 5X3, and 5X4.

Stock No.	Description	List Price
12629	Capacitor—56 Mmfd. (C14)	$0.20
12724	Capacitor—120 Mmfd. (C28)	.28
13052	Capacitor—470 Mmfd. (C27)	.30
12484	Capacitor—0.25 Mfd. (C29)	.24
13199	Lead—Antenna lead, approximately 20 feet long	.90
11172	Resistor—470,000 ohms—carbon type, 1/4 watt (R16)—Package of 5	1.00
12801	Transformer—First intermediate frequency transformer, complete with shield (L9, L10, C13, C14)	1.70

Prices quoted above are subject to change without notice.

SERVICE DIVISION

RCA Manufacturing Company, Inc.

CAMDEN, N. J., U. S. A.

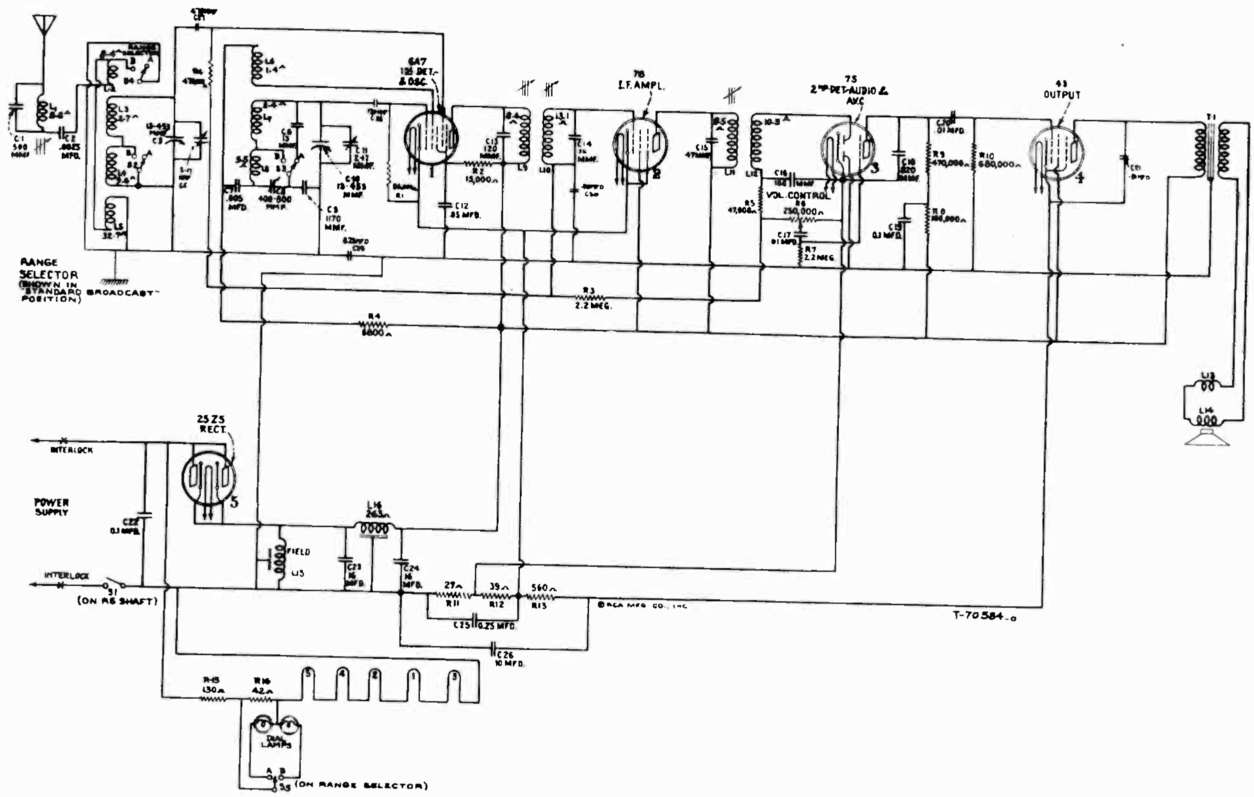


Figure 3—Schematic Circuit Diagram

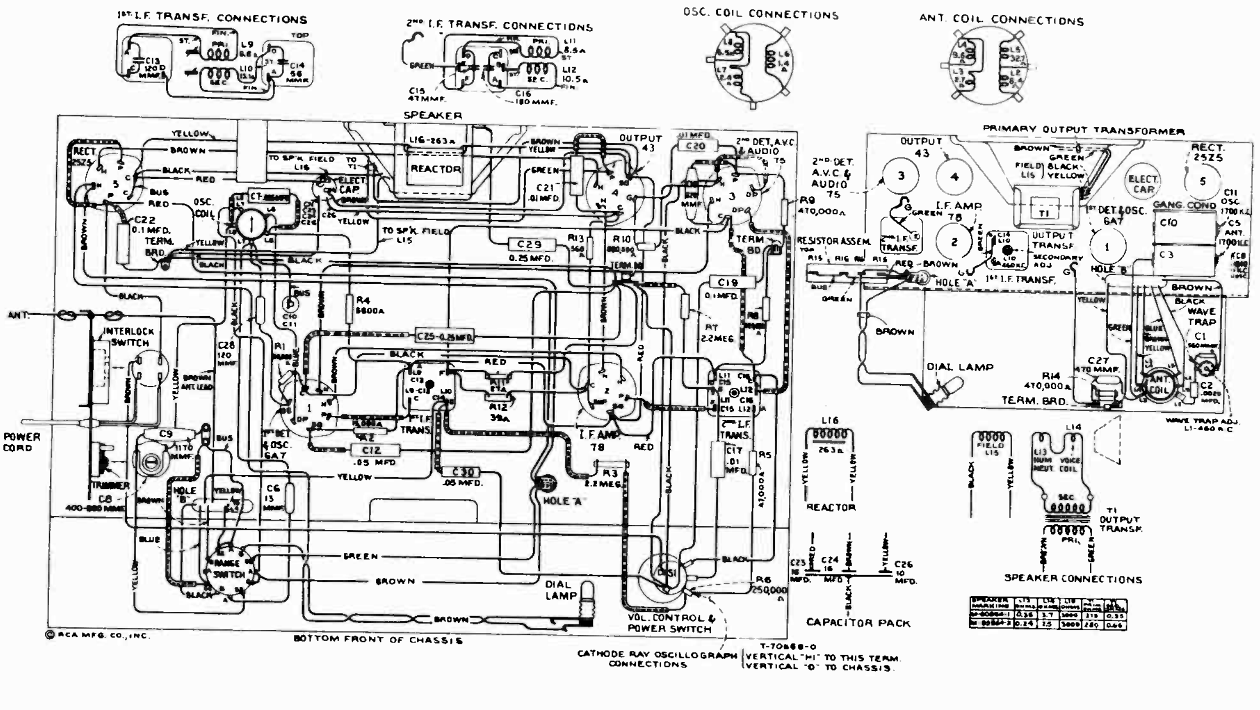


Figure 4—Chassis Wiring Diagram

RCA VICTOR MODEL 5X2

Five-Tube, Two-Band, AC-DC, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard broadcast" .... 540-1,800 kc.
"Short-wave" .... 1,800-6,500 kc.

ALIGNMENT FREQUENCIES
"Standard broadcast" ...... 600 kc. (osc.); 1,700 kc. (osc. and ant.)
"Short-wave" .... None Required

Intermediate Frequency .... 460 kc.

RADIOTRON COMPLEMENT
(1) RCA-6A7 .... First Detector–Oscillator
(2) RCA-78 .... Intermediate Amplifier
(3) RCA-75 ..... Second Detector, A-F, and A.V.C.
(4) RCA-43 .... Power Output
(5) RCA-12Z3 .... Rectifier

POWER SUPPLY
200-250 volts, 50-100 cycles .... 120 watts
200-250 volts, D-C .... 110 watts

POWER OUTPUT
Undistorted .... 0.9 watts A-C, 0.7 watts D-C
Maximum .... 2 watts A-C, 1.6 watts D-C

LOUDSPEAKER
Type .... Electrodynamic
Voice Coil Impedance .... 2.2 ohms at 400 cycles

Pilot Lamps (2) .... Mazda No. 40, 6.3 volts, 0.15 amperes

Mechanical Specifications

CABINET DIMENSIONS
Height .... 9¼ inches   Width .... 12⅛ inches   Depth .... 5½ inches
Weight (Net) .... 16 pounds   Weight (Shipping) .... 20 pounds
Chassis Base Dimensions .... 9⅛ inches x 4¾ inches x 1⅞ inches
Over-all Height of Chassis .... 6⅛ inches
Tuning Drive Ratio .... 5 to 1
Operating Controls .... (1) Power Switch–Volume, (2) Tuning, (3) Range Selector

General Features

This model contains a five-tube chassis mounted in a table-type cabinet. The superheterodyne type of circuit is used, with such features of design as: automatic volume control, diode detection, magnetite core adjusted i-f transformers, improved core adjusted antenna wave-trap, band-selective illumination of full vision dial scales, resistance coupled audio system and an electrodynamic loudspeaker. Tuning range is continuous through the "Standard broadcast," and "Short wave" bands (including 49 meters). The short wave portion of this extensive range also includes channels assigned for police, amateur and aviation communication. Trimmer adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation.

Circuit Arrangement

The conventional superheterodyne type of circuit, consisting of a combined first-detector–oscillator stage, a single i-f stage, a diode-detector automatic-volume-control stage, an audio voltage amplifier stage, an audio power output stage, and a half-wave rectifier power supply stage, is used.

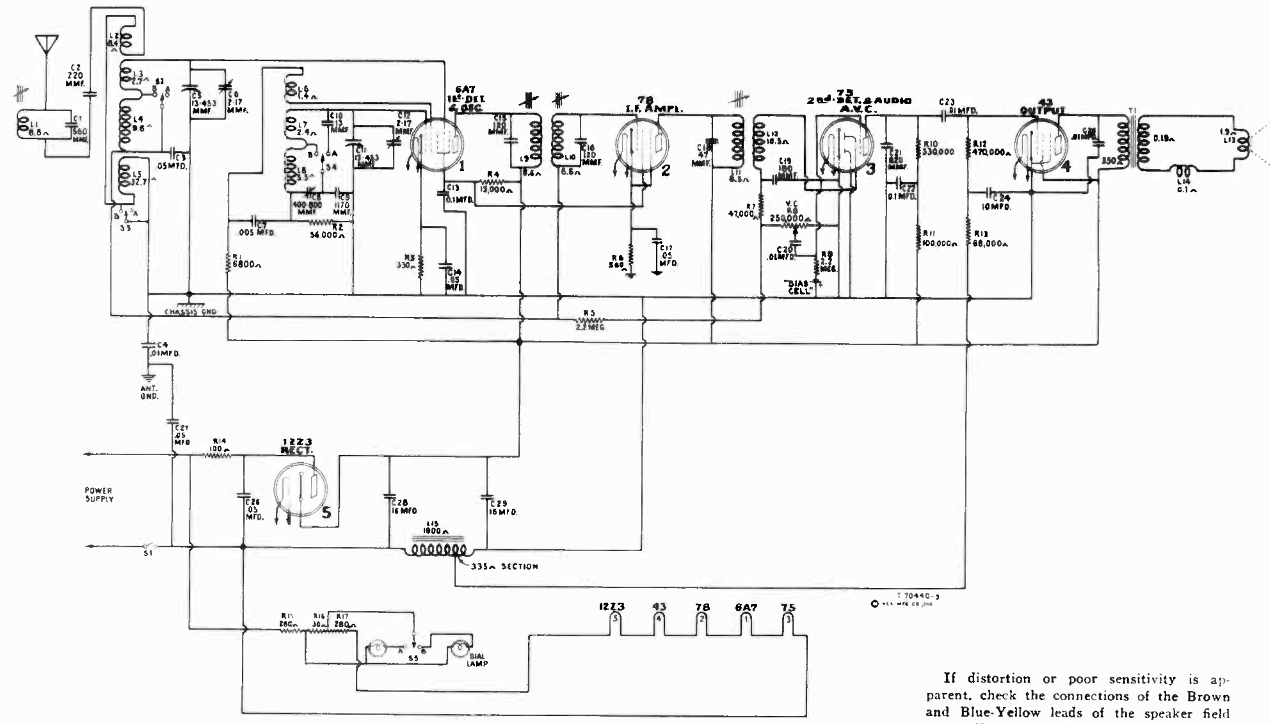
Tuned Circuits

The antenna coil system consists of two series-connected primary and two series-connected secondary windings to provide the two ranges of tuning. The oscillator coil is similarly wound on a single form. A multi-pole range selector switch, consisting of S2, S3, S4, and S5, is used to connect the various sections of these coil systems and to illuminate the proper tuning dial scale for the band in operation. The coils are tuned by a variable two-section gang condenser having trimming capacitors in shunt with each section. A series trimming capacitor is also associated with the "Standard broadcast" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-78 in a transformer coupled circuit. This stage operates at a basic frequency of 460 kc. Adjustable magnetite cores are provided for adjusting inductance of the input i-f transformer (primary and secondary) and the output transformer (primary) windings.

Detector and A.V.C.

The modulated signal, as obtained from the output of the i-f stage, is detected by one of the diodes in the RCA-75 tube. The audio frequency component, secured by this process, is transferred from the movable arm of the volume control R8 through coupling



If distortion or poor sensitivity is apparent, check the connections of the Brown and Blue-Yellow leads of the speaker field to certify that they are properly attached to the connector terminals.

Figure 1—Schematic Circuit Diagram

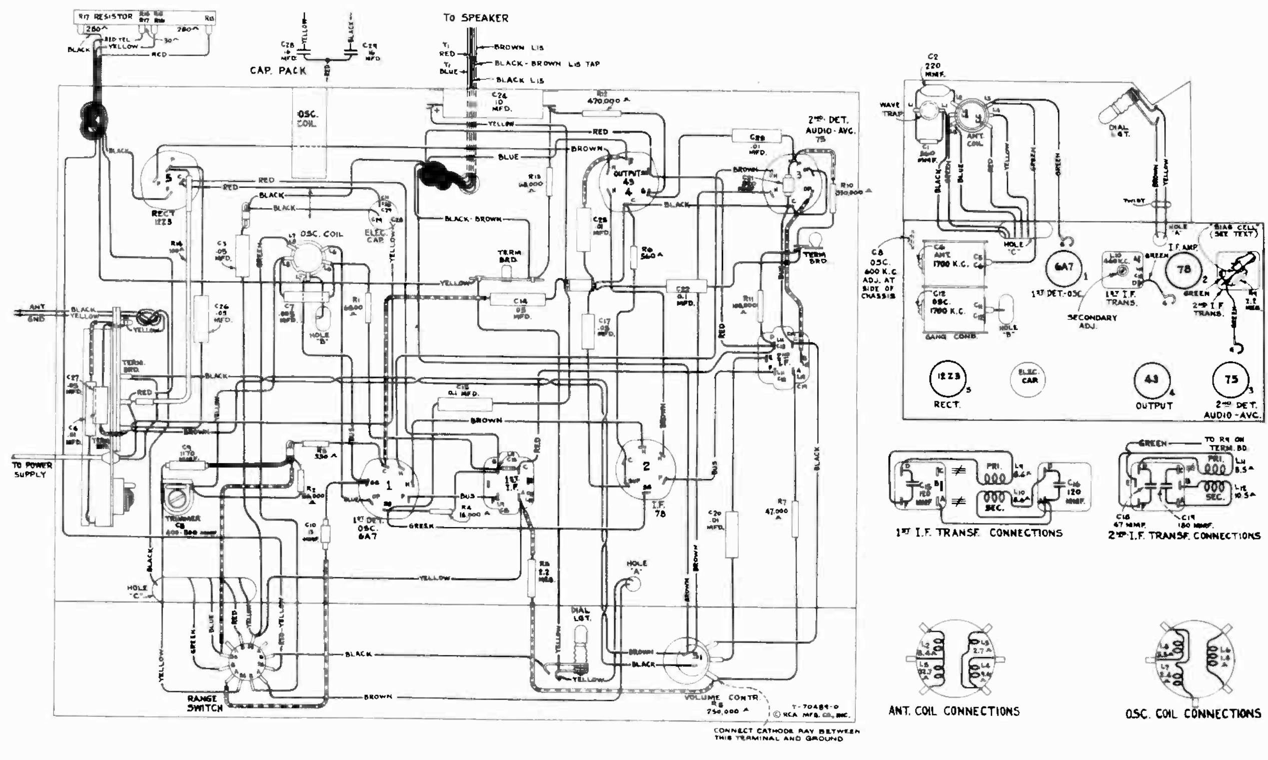


Figure 2—Chassis Wiring Diagram, Radiotron, Coil, and Trimmer Locations

capacitor C20 to the control grid of the RCA-75 for voltage amplification. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage which develops across resistor R8 is applied as automatic control grid bias to the first-detector and i-f tube through a suitable resistance filter circuit.

Audio System

The audio frequency component, mentioned under "Detection and A.V.C.," transferred to the control grid of the RCA-75, is amplified in the tube and then coupled to the control grid of the power output tube RCA-43 through capacitor C23. The output of the power amplifier is transformer coupled into the dynamic loudspeaker. A single "Bias Cell," see figures 1 and 2, is used for supplying bias voltage to the control grid of the RCA-75 tube.

Rectifier

The plate, grid, cathode, and loudspeaker field voltages required for the operation of this receiver are supplied by the RCA-12Z3 tube operating as a half-wave rectifier.

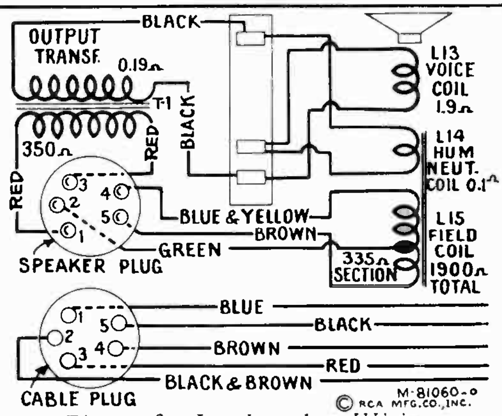


Figure 3—Loudspeaker Wiring

SERVICE DATA

CAUTION: Certain tests (e.g. alignment and voltage measurement) require operation of receiver with chassis removed from cabinet. Avoid external grounding of receiver chassis or associated equipment since the power supply is now connected to receiver chassis through the speaker field. Carelessness may cause serious damage to equipment.

Alignment Procedure

There are three alignment trimmers provided in the antenna coil and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of three screws attached to molded magnetite cores.

Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as the **RCA Stock No. 9595** will be required as the source of the signal at the specified alignment frequencies. Visual indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Output Indicator** is especially suitable for this use.

The procedure outlined below should be followed in adjusting the various trimming capacitors and molded magnetite cores.

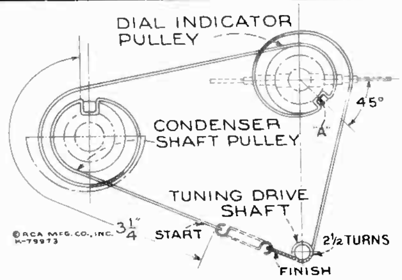


Figure 4—Tuning Drive Cord Mechanism

Rear view of drive assembly showing threading of drive cord with variable condenser plates in full mesh. To perform this operation, unsolder the four leads (connected between antenna coil and range selector switch) from the range selector switch, unsolder antenna lead-in wire from wave-trap terminal, unsolder lead from rear section of gang tuning condenser, and remove the four screws which secure the tuning drive frame to the chassis proper. This frame with gang tuning condenser still attached may now be easily removed for the threading operation. The relative position of the parts and method of threading are shown on the above diagram. In case the cord is too long for proper tension, it may be effectively shortened by first releasing finish end of cord, inserting a match or other shim under the cord at point "A" and then re-hooking the end of the cord to the tension spring. Replace drive assembly and re-solder leads.

I-F Core Adjustments

The three adjustment screws (one on top and one on bottom of first i-f transformer and one on bottom of second i-f transformer) are located as shown by figures 2 and 6. Each circuit must be aligned to a basic frequency of **460 kc.** To do this attach the output indicator across the loudspeaker voice coil or across the output transformer primary. Connect the output of the test oscillator through a **.05 mfd.** capacitor to the RCA-6A7 control grid, the ground of the test oscillator being connected to the receiver external yellow ground lead. Set the test oscillator to **460 kc.** Place the range selector in "Short wave" position. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator.

Adjust the bottom magnetite core screw of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the two magnetite core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device.

During these adjustments regulate the test oscillator output so the indication is always as low as possible. By doing so, broadness of tuning due to A.V.C. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment.

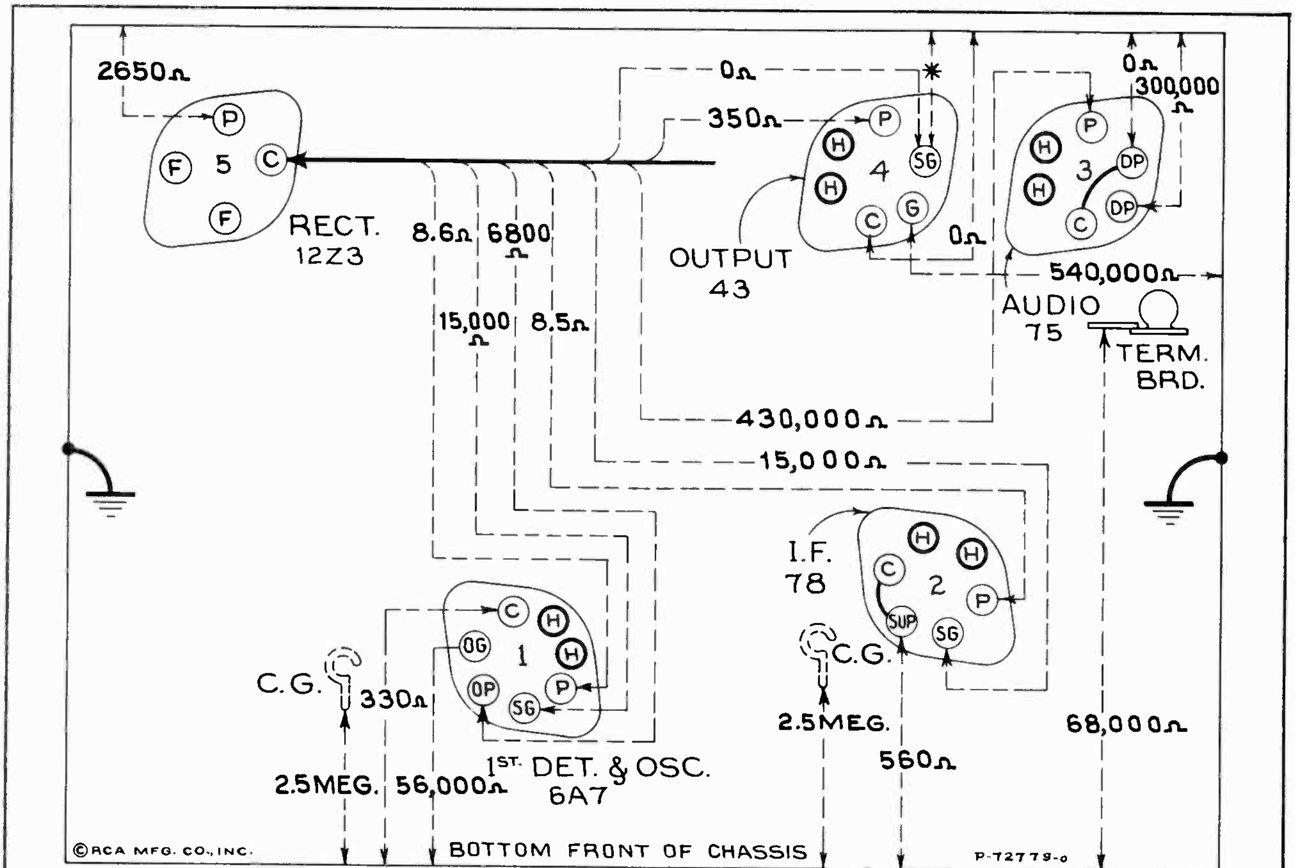
Wave-Trap Adjustment

Attach the output of the test oscillator to the black antenna lead through a **200 mmfd.** capacitor, the ground connection of the test oscillator and receiver being connected as before.

Leave the test oscillator adjusted to **460 kc.**, and range selector in "Short wave" position as before. Then adjust the wave-trap trimmer to the point which causes maximum suppression of the **460 kc.** signal.

R-F Trimmer Adjustments

Roughly calibrate the tuning dial by setting the pointer to the bottom horizontal line at the low frequency end of the broadcast scale with the two-gang tuning condenser at its maximum capacity. The output indicator should be left connected to the output system. The connections for the test oscillator remain the same as for "Wave-trap" adjustment. Volume control should be in maximum position.



CAUTION: REMOVE BIAS CELL BEFORE MAKING RESISTANCE MEASUREMENTS.
NOTE: * OPEN CIRCUIT (LEAKAGE ELECTROLYTIC CAPACITORS ONLY).

Figure 5—Resistance Diagram

Power supply disconnected—Tuning condenser in full mesh—Volume control at maximum
Radiotrons in sockets

Resistance Measurement

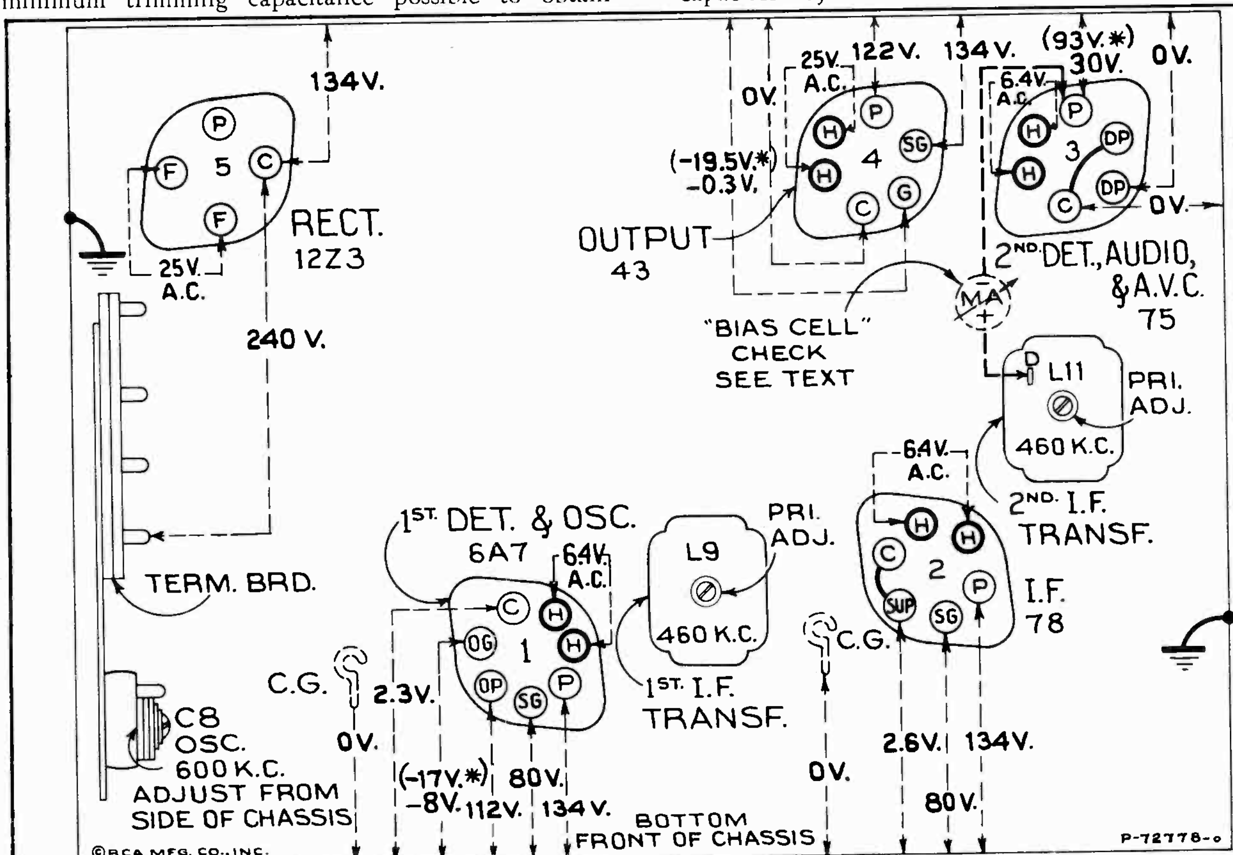
CAUTION: The "Bias Cell," see figures 1 and 2, should be carefully removed before any resistance measurements are made. Do not allow the spring contact clips to short-circuit "Bias Cell" during its removal or insertion.

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 5 have been carefully selected so as to facilitate a rapid check of the circuit for defective parts, bad joints, etc. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and the Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which would otherwise be difficult to ascertain. Each value as specified should hold within $\pm$ 20%. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. Resistance values were measured with the Radiotrons in sockets; power supply disconnected; tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative (–) terminal of the resistance meter to the chassis ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

Set range selector to "Standard broadcast" position.

Set oscillator and antenna trimming capacitors **C12** and **C6**, respectively, to a position near minimum capacitance (plates near out). Adjust the test oscillator to **1,700 kc.**

Tune the receiver to pick up this signal (near **1,700 kc.** on dial) for maximum response disregarding dial reading. Always keep test oscillator output as low as is possible and still obtain visual indication. Adjust trimming capacitors **C12** and **C6** so that each produces maximum (peak) receiver output, re-adjusting receiver tuning slightly if necessary, but using the minimum trimming capacitance possible to obtain peaks. Adjust the dial pointer (without disturbing gang tuning condenser) to a dial reading of **1,700 kc.** Shift the test oscillator to **600 kc.** Tune the receiver to receive the signal disregarding the dial reading at which it is best received. Then adjust the oscillator series capacitor, **C8**, simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at **1,700 kc.** should then be repeated to correct for any change which may have been caused by the oscillator series trimming capacitor adjustment.



CAUTION: NEVER CONNECT VOLTMETER TO CONTROL GRID OF TUBE Nº 3 (RCA-75)—SEE TEXT.

Figure 6—Radiotron Socket Voltages and Trimmer Locations

Measured at 230 volts, 60 cycle supply—For 230 volt D-C approximately 10% lower
Tuned to approximately 1,000 kc. ("Standard broadcast" position)—No signal being received—
Volume control setting optional

Radiotron Socket Voltages

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

CAUTION: The voltage between the RCA-75 control grid and ground should never be measured. All ordinary meters will paralyze the "Bias Cell," see figures 1 and 2, in this circuit for a period of approximately one to two hours. To check "Bias Cell," connect 0-1 M.A. milliammeter as shown on figure 6. A satisfactory cell should give a steady reading on the meter between 0.3 and 0.65 M.A. when used with a good RCA-75 tube.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors and terminals to receiver chassis ground on figure 6 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with set tuned to approximately 1,000 kc. ("Standard broadcast" range); no signal being received and volume control setting optional. To duplicate the conditions under which the voltages were measured requires a 1,000 ohm-per-volt d-c meter, having ranges of 10, 50 and 250 volts. Voltages between 0 and 10 read on 10-volt scale, between 10 and 50 on 50-volt scale, and between 50 and 250 on 250-volt scale. A-C voltages were measured with a corresponding a-c meter.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
11409	Band—Rubber band for first I.F. Transformer—Package of 5	.10
12118	Cap—Grid contact cap—Package of 5	.15
11978	Capacitor—Adjustable capacitor (C8)	.50
12535	Capacitor—13 Mmfd. (C10)	.18
12405	Capacitor—47 Mmfd. (C18)	.26
12404	Capacitor—120 Mmfd. (C15, C16)	.26
12406	Capacitor—180 Mmfd. (C19)	.26
12694	Capacitor—220 Mmfd. (C2)	.22
12537	Capacitor—560 Mmfd. (C1)	.20
12536	Capacitor—820 Mmfd. (C21)	.25
12534	Capacitor—1,170 Mmfd. (C9)	.28
4868	Capacitor—.005 Mfd. (C7)	.20
4858	Capacitor—.01 Mfd. (C4, C20, C23, C25)	.25
4836	Capacitor—.05 Mfd. (C3, C14, C17)	.30
12078	Capacitor—.05 Mfd. (C26, C27)	.30
4841	Capacitor—0.1 Mfd. (C13, C22)	.22
12682	Capacitor—10 Mfd. (C24)	.70
12677	Capacitor—2 Sections each 16 Mfd. (C28, C29)	3.12
12681	Cell—Bias cell for Stock No. 12676	.30
12495	Coil—Antenna coil (L2, L3, L4, L5)	1.30
12680	Coil—Coil windings and form only for second I.F. transformer Stock No. 12676 (L11, L12)	.60
12496	Coil—Oscillator coil (L6, L7, L8)	.80
12006	Core—Adjustable core for Stock No. 12403, 12497 and 12676	.22
4340	Lamp—Dial lamp—6.3 volt—Package of 5	.60
12409	Lead—Antenna lead—approximately 20 feet long	.35
12395	Range Switch—(S2, S3, S4, S5)	.68
12697	Resistor—100 ohm, flexible type (R14)—Package of 5	.65
12481	Resistor—330 ohm, insulated, ¼ watt, (R3)—Package of 5	1.00
12414	Resistor—560 ohm, insulated ¼ watt, (R6)—Package of 5	1.00
12265	Resistor—6,800 ohm, insulated, ¼ watt, (R1)—Package of 5	1.00
12695	Resistor—15,000 ohm, insulated, ¼ watt, (R4)—Package of 5	1.00
12412	Resistor—47,000 ohm, insulated, ¼ watt, (R7)—Package of 5	1.00
12286	Resistor—56,000 ohm, insulated, ¼ watt, (R2)—Package of 5	1.00
12696	Resistor—68,000 ohm, insulated, ¼ watt, (R13)—Package of 5	1.00
12263	Resistor—100,000 ohm, insulated, ¼ watt, (R11)—Package of 5	1.00
12452	Resistor—330,000 ohm, insulated, ¼ watt, (R10)—Package of 5	1.00
12285	Resistor—470,000 ohm, insulated, ¼ watt, (R12)—Package of 5	1.00
12679	Resistor—2.2 Megohm, insulated, ¼ watt, (R5, R9)—Package of 5	1.00
12008	Shield—First I.F. transformer shield	.28
12607	Shield—First I.F. transformer shield top	.30
12218	Shield—Radiotron shield	.15
12678	Shield—Second I.F. transformer shield complete with bias cell holder	.38
12400	Socket—Dial lamp socket	.22
4794	Socket—4-contact 12Z3 Radiotron socket	.15
4786	Socket—6-contact 43, 75, or 78 Radiotron socket	.15
4787	Socket—7-contact 6A7 Radiotron socket	.15
12007	Spring—Retaining spring for Stock No. 12006—Package of 10	.36
12403	Transformer—First I.F. transformer with shield (L9, L10, C15, C16)	1.62
12676	Transformer — Second I.F. transformer complete with shield (L11, L12, C18, C19, R3)	1.72
12497	Trap—Wave trap (L1)	.70
12394	Volume Control — Control and power switch (R8, S1)	1.06
	DRIVE ASSEMBLY	
12401	Condenser—2-gang variable tuning condenser (C5, C6, C11, C12)	2.35
12420	Cord—Variable tuning condenser drive cord—Package of 5	.20
12608	Dial—Station selector dial scale	.45
12419	Indicator—Station selector indicator pointer	.15
12416	Pulley—Indicator pointer shaft and pulley	.24
12417	Pulley—Variable tuning condenser pulley and set screws	.24
12418	Screw—8-32x3/16 milled head, cupped point, set screw for pulley Stock No. 12417—Package of 10	.18
12422	Shaft—Variable condenser tuning knob shaft	.26
12421	Spring—Drive cord tension spring—Package of 10	.60
	REPRODUCER ASSEMBLY	
12641	Board—Reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket	.18
12674	Coil—Reproducer field coil (L15)	1.70
11469	Coil—Reproducer neutralizing coil (L14)	.20
12642	Cone—Reproducer cone and dust cap (L13)	.94
12493	Connector—5-contact female connector for reproducer cable	.20
12567	Connector—5-contact male connector for reproducer cable	.22
9711	Reproducer complete	6.42
11828	Transformer—Output transformer (T1)	1.46
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLY	
12548	Crystal—Dial escutcheon and crystal	1.06
12673	Knob—Station selector, volume control or range switch knob—Package of 5	.58
12672	Resistor—Wire wound ballast and line resistor comprising two 280 ohm sections and one 42 ohm section (R15, R16, R17)	1.55
11210	Screw—Chassis mounting screw assembly comprising 1 screw, 1 lockwasher and 1 washer—Package of 4	.28
4119	Screw—Set screw for knob Stock No. 12673—Package of 20	.38

First Edition.

Prices quoted above are subject to change without notice.

Printed in U. S. A.

RCA VICTOR MODELS 6BT, 6BK, 6BT6, and 6BK6

Six-Tube, Two-Band, Battery-Operated, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard Broadcast" (A) .... 530-1,900 kc
"Short Wave" (C) .... 5,800-21,600 kc

ALIGNMENT FREQUENCIES
"Standard Broadcast" (A) .... 600 kc (osc.), 1,700 kc (osc., ant.)
"Short Wave" (C) .... 20,000 kc (osc., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-1C6 .... First-detector–Oscillator
(2) RCA-1A4 .... Intermediate Amplifier
(3) RCA-1F6 .... Second-detector–A.F.–A.V.C.
(4) RCA-30 .... Audio Driver
(5) RCA-49 .... Power Output
(6) RCA-49 .... Power Output

Pilot Lamps .... 6BT or 6BK (1); 6BT6 or 6BK6 (2); Mazda 2.0 volts, .06 ampere, miniature screw base

BATTERIES REQUIRED
6BT or 6BK .... "A," one plug-in 2½-volt Air-cell (Eveready A-600 or equivalent), or one 2-volt storage battery; "B," three 45-volt B batteries (Burgess No. 21308, Eveready No. 486, or equivalent); "C," one 7½-volt C battery (Burgess No. 5540, Eveready No. 773, or equivalent), and four bias cells (Stock No. 12681).
6BT6 or 6BK6 ...... "A," one 6-volt storage battery; "B," none required; "C," one 7½-volt C battery (Burgess No. 5540, Eveready No. 773, or equivalent), and four bias cells (Stock No. 12681).

CURRENT CONSUMPTION	6BT or 6BK	6BT6 or 6BK6
"A" at 2 volts	0.52 amp. (pilot lamp off)	
"A" at 2 volts	0.58 amp. (pilot lamp on)	
"A" at 6.0 volts		1.35 amps.
"A" at 6.3 volts		1.40 amps.
"B" at 135 volts	19 ma.	(Supplied from vibrator)
Fuse Rating	½ amp.	3 amp.
POWER OUTPUT		
Undistorted	1.2 watts	1.0 watts
Maximum	2.2 watts	1.6 watts

Mechanical Specifications

CABINET DIMENSIONS	6BT	6BK	6BT6	6BK6
Height	21 inches	38 inches	21 inches	38 inches
Width	13¼ inches	23⅛ inches	13¼ inches	23⅛ inches
Depth	11½ inches	11⅛ inches	11½ inches	11⅛ inches
WEIGHTS				
Net	21 pounds	46 pounds	33 pounds	57 pounds
Shipping	26 pounds	58 pounds	37 pounds	69 pounds

Chassis Base Dimensions .... 12 inches x 7 inches x 2½ inches
Over-all Height of Chassis .... 7⅛ inches
Operating Controls .... (1) Tone, (2) Tuning, (3) Volume, (4) Range Selector, (5) Power Switch (located on right side of cabinet).
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

These receivers employ the same type chassis. The table models 6BT and 6BT6 each employ an eight-inch, dust-proof, permanent-magnet, dynamic loudspeaker while the console Models 6BK and 6BK6 each employ a twelve-inch, dust-proof, permanent-magnet, dynamic loudspeaker. Models 6BT and 6BK obtain their plate supply from "B" batteries and their filament supply from either a 2½-volt Air-cell or a 2-volt storage battery. Models 6BT6 and 6BK6 obtain their plate supply from a compact, vibrator power-

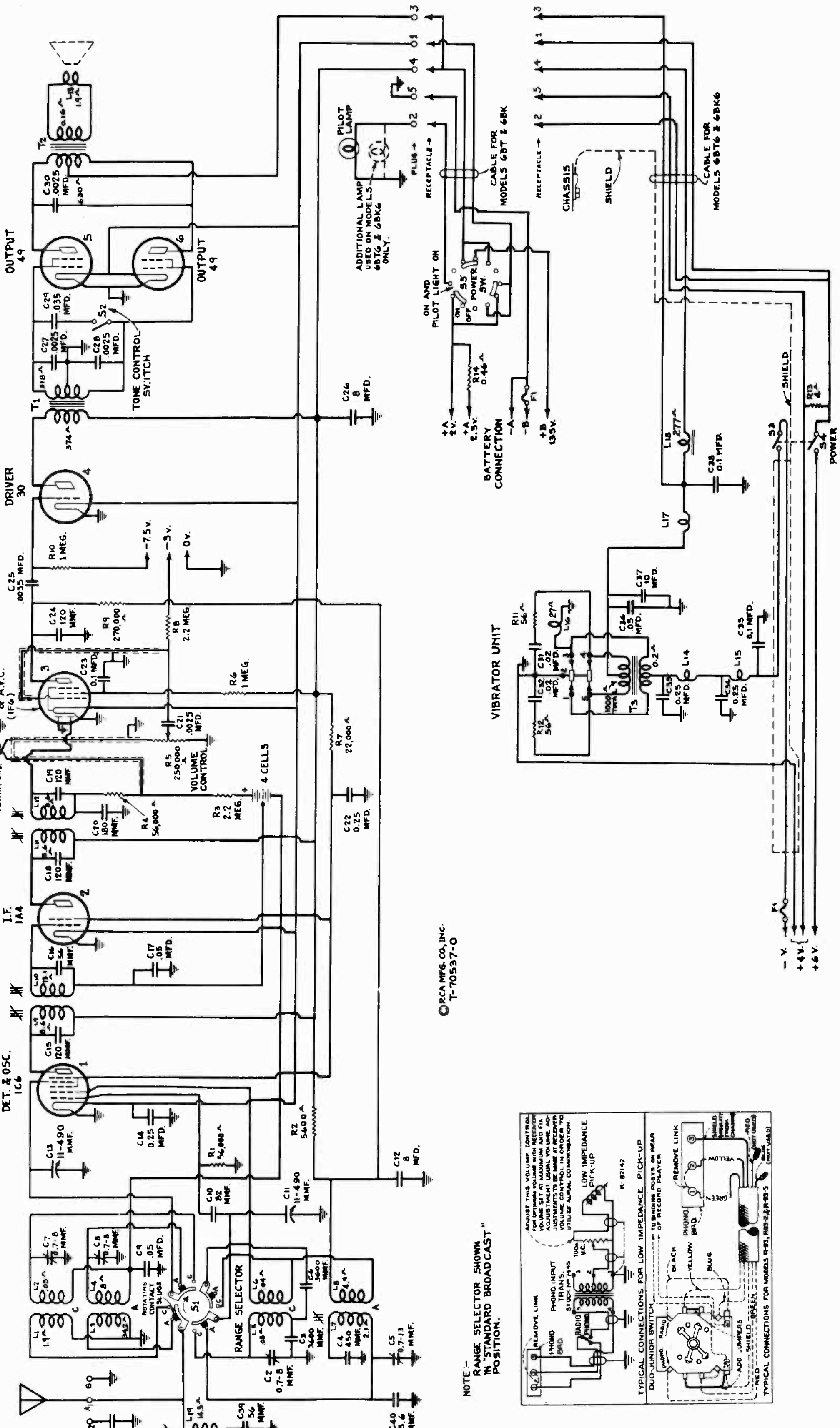


Figure 1—Schematic Circuit Diagram

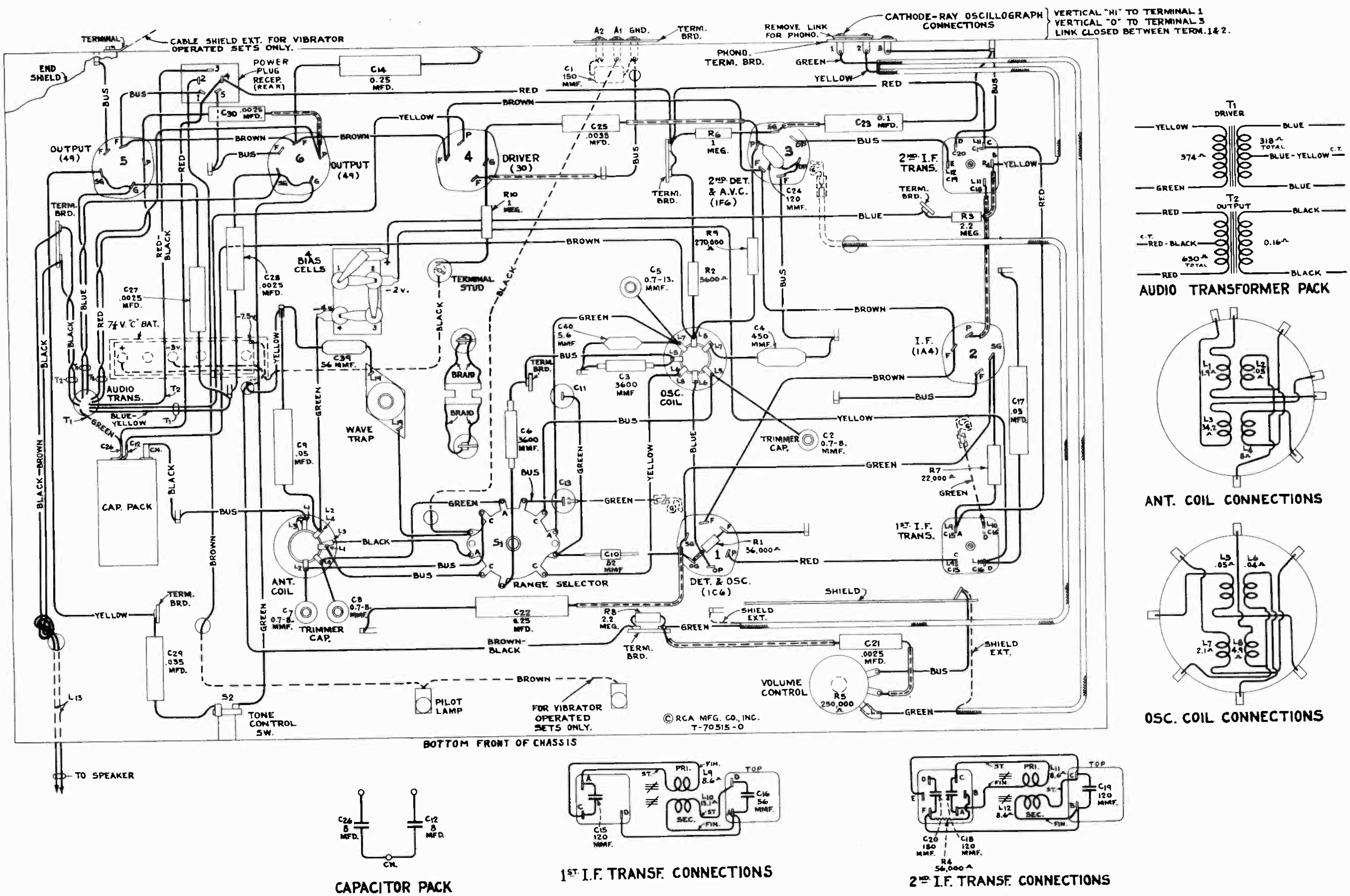


Figure 2—Chassis Wiring Diagram

supply unit, which, in turn, is operated from a 6-volt storage battery. One cell (2 volts) of this same storage battery is used to supply filament voltage to the Radiotrons. The vibrator is of the "plug-in" type which permits ready removal or replacement. Models 6BT and 6BK have a pilot-lamp switch combined with the main power switch so that the pilot lamp may be turned off, after the receiver is tuned in, to conserve battery current.

The circuit used in these receivers is of the superheterodyne type with such design features as magnetite core adjusted i-f transformers, improved core-adjusted antenna wave-trap, high-frequency tone control, automatic volume control, phonograph terminal board, new edge-lighted dial, plunger-type air trimming capacitors, and built-in antenna coupler.

Circuit Arrangement

The first-detector and oscillator functions are combined in the RCA-1C6 tube. The input of this tube is coupled to the antenna through a tuned r-f transformer. A series wave-trap, tuned by means of an adjustable magnetite core, is connected from antenna to ground to prevent signals of intermediate frequency (460 kc) from being introduced into the first stage as interference. Both the oscillator and antenna circuits employ separate coils for each band. These coils are tuned by means of individual plunger-type air trimming capacitors.

The intermediate-frequency stage is coupled to the RCA-1C6 and to the RCA-1F6 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by one of the diode plates of the RCA-1F6. The audio component of this rectified signal, which develops across the volume control R5, is fed thru coupling capacitor C21 to the control grid of this same RCA-1F6 for audio voltage amplification. The d-c component resulting from the detection process is fed thru resistance-capacitance filters to the control grid returns of the RCA-1C6 and RCA-1A4 tubes as automatic volume control bias. Bias cells are connected in these grid circuits to provide bias voltage under conditions of little or no signal. The output of the RCA-1F6 is resistance-capacitance coupled to the RCA-30 driver which, in turn, is transformer-coupled to the two RCA-49 tubes used for push-pull class B output. The output of this push-pull stage is transformer-coupled into the permanent-magnet dynamic loudspeaker. A two-position, high-frequency tone control, consisting of C29 and S2, is connected across the secondary of the driver transformer T1.

Models 6BT6 and 6BK6 obtain their plate supply from a vibrator-type power unit. The vibrator together with the power transformer T3 combine the functions of generating alternating current and rectification. Filter chokes and capacitors are built into this unit to eliminate interference (noise) which would otherwise be introduced into the receiver circuits.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adja-

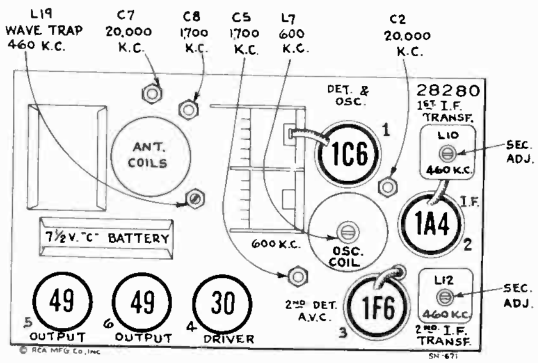


Figure 3—Radiotron, Coil, and Trimmer Locations

cent to the symbols signifying these parts on the diagrams. Identification titles, such as C1, L1, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Ratings of less than one ohm are generally omitted.

Caution: The four bias cells are used only for the purpose of supplying bias potential and should never be measured with an ordinary voltmeter or other device which draws any current. A simple check on these cells may be made by connecting a milliammeter in the plate circuit of the RCA-1C6 tube and noting the plate current reading. Then remove the two bias cells (3 and 4), being careful that the spring contact clips do not short-circuit them during removal. Connect a 4-volt battery between the + and — 4v. terminals of the bias cell board, and again note the plate current reading. If the first reading obtained (with bias cells) is more than 40% from the latter reading (with 4-volt battery), all bias cells should be replaced. This 40% difference is equivalent to a change of approximately 25% battery voltage.

Alignment Procedure

There are five alignment adjustments provided in the antenna and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595**, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustments is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 7. Each circuit must be aligned to a basic frequency of **460 kc.**

Connect the "Ant." output of the test-oscillator to the control grid of the RCA-1C6 through a **.05 mfd.** capacitor. Connect the test oscillator "Gnd." terminal to the ground terminal of the receiver chassis. The receiver range selector should be in its "Short wave" position. Tune the test oscillator to **460 kc.** Adjust the receiver tuning control to a point, within its range, where no interference is encountered either from broadcast stations or from the heterodyne oscillator.

Adjust the two magnetite core screws **L12** and **L11** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws **L10** and **L9** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme low-frequency end calibration mark **(530 kc)** on "Standard Broadcast" scale while the gang tuning condenser plates are in their full-mesh position. Alignment should be made in sequence of "Wave-trap," "Standard broadcast," and "Short wave" respectively.

Wave-Trap Adjustment

Attach the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a **200-mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to **460 kc** and range selector in "Short wave" position as before. Then adjust the wave-trap screw to the point which causes maximum suppression of the **460 kc** signal.

"Standard Broadcast" Band

Connections for the test oscillator remain the same as for "Wave-trap adjustment." Adjust the test oscillator to **1,700 kc** and set the receiver tuning control

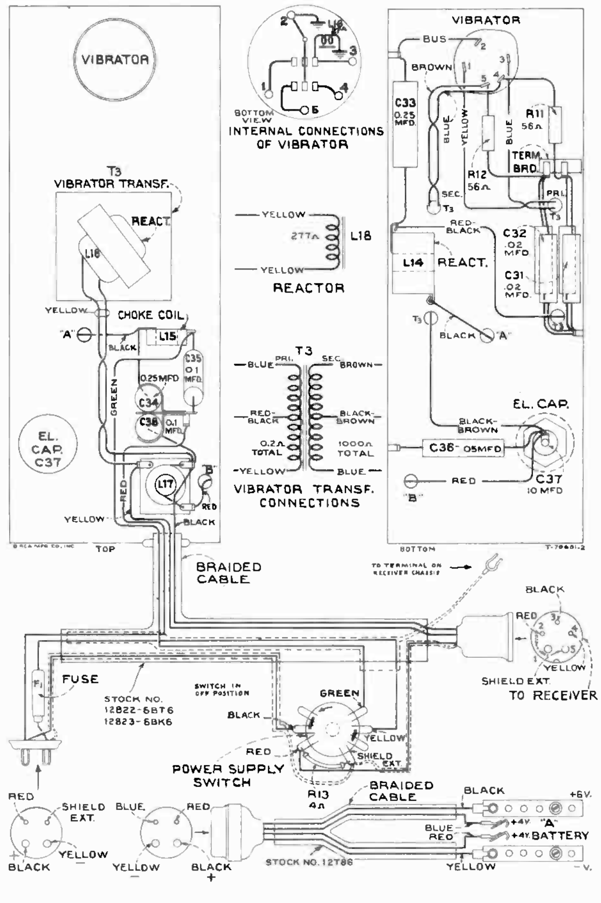


Figure 4—Power Unit Wiring (6BT6 and 6BK6)

to a dial reading of **1,700 kc** with its range selector changed to "Standard broadcast" position. Leave the volume control of the receiver at its maximum position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two plunger-type air trimmers, **C5** and **C8**, of the oscillator and antenna coils so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator frequency to **600 kc.** Tune the receiver to pick up this signal **near 600 kc,** disregarding the dial reading at which it is best received. Then, adjust the oscillator magnetite core screw **L7** (top of oscillator coil) simultaneously rocking the receiver tuning control backward and forward thru the signal until maximum receiver output results from these combined operations. The adjustments at **1,700 kc** should then be repeated to correct for any change which may have been caused by the **600 kc** oscillator adjustment. Tighten lock nuts on **C5** and **C8.**

"Short Wave" Band

Connect the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a **300-ohm** resistor, leaving the ground connections as before. Place the receiver range selector to its "Short wave" position and set the dial pointer to **20,000 kc.** Adjust test oscillator to **20,000 kc.** Adjust the oscillator air trimmer **C2** to produce maximum (peak) output. Two positions of this trimmer may be found which produce maximum output. The position of minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the antenna air trimmer **C7** to produce maximum (peak) output while slightly rocking the gang tuning condenser back and forth thru the signal. Two positions may be found on this trimmer which produce maximum output. The position of maximum capacitance (plunger near in) should be used. Tighten lock nut. Check for image signal by changing the receiver dial setting to **19,080 kc.** If the oscillator air trimmer **C2** has been correctly adjusted, the image signal will be received at this position. No adjustments should be made while checking for the image signal.

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R–93, R–93–2, and R–93–S Record Players are shown on the schematic diagram (figure 1).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very

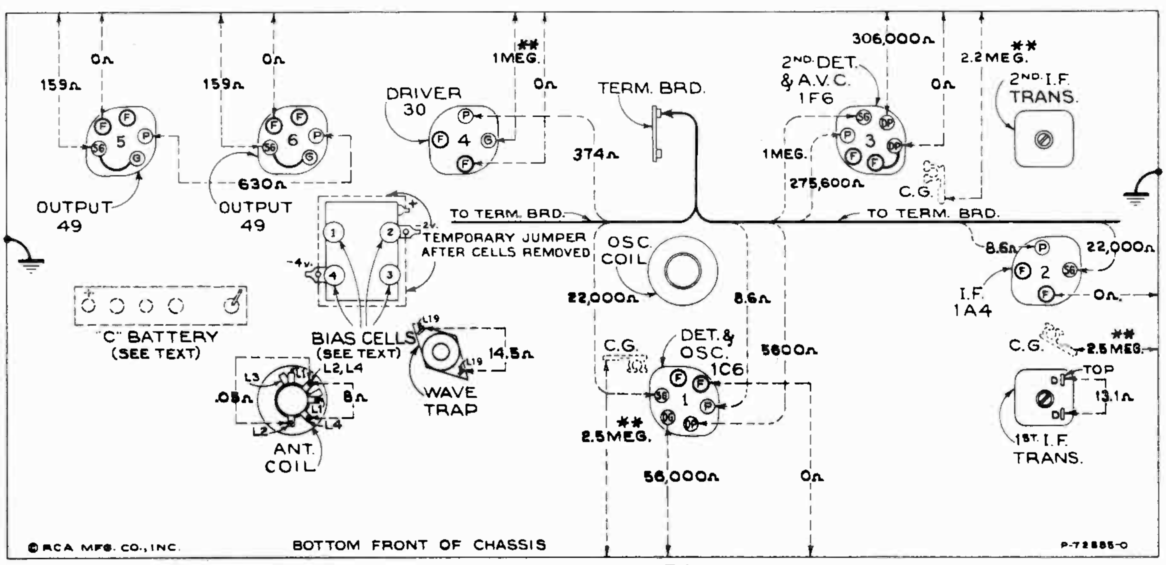


Figure 5—Resistance Diagram

Power-supply cable disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Bias cells and "C" battery removed—Volume setting optional

Resistance Measurements

*****Before making any resistance measurements, remove the four bias cells and connect jumpers on bias-cell board as shown. Also, remove the "C" battery and connect the two leads (—7½ v. and —3 v.) to chassis ground. After measurements are completed, remove jumpers from bias-cell board and then carefully insert bias cells. Next, insert "C" battery and restore leads to their respective positions.***

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 5, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm 20\%$. Variations in excess of this limit will usually be indicative of trouble in circuit under test. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

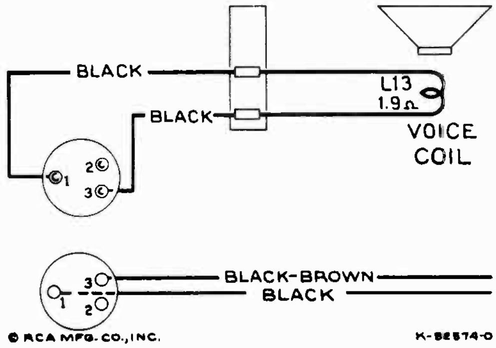


Figure 6—Loudspeaker Wiring

Power Supply (Models 6BT and 6BK)

Filament voltage for these receivers is obtained from either a 2½-volt Air-cell or a 2-volt storage battery. When the Air-cell is used, the 0.46-ohm resistor R14 must be connected in series with the A-battery lead as shown on figure 8. When operating on a 2-volt storage battery, this resistor R14 should be removed. Plugs are provided on the battery cable (see figure 8) for plugging in the Air-cell and B batteries. The A-battery plug should be removed when operating on a 2-volt storage battery. The 7½-volt C battery is located on the top-side of the chassis and securely held in place by a metal cover (see figure 3). The four bias cells are located underneath the chassis (see figures 2 and 5).

Radiotron Plate Current Readings

Measured with Milliammeter Connected at Tube Socket Plate Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-1C6—1st. Det.	1.2 ma.
	—Osc.	3.7 ma.
(2)	RCA-1A4—I.F.	3.4 ma.
(3)	RCA-1F6—2nd Det.—A.F.—A.V.C.	0.3 ma.
(4)	RCA-30—Driver	4.0 ma.
(5)	RCA-49—Output	1.6 ma.
(6)	RCA-49—Output	1.6 ma.

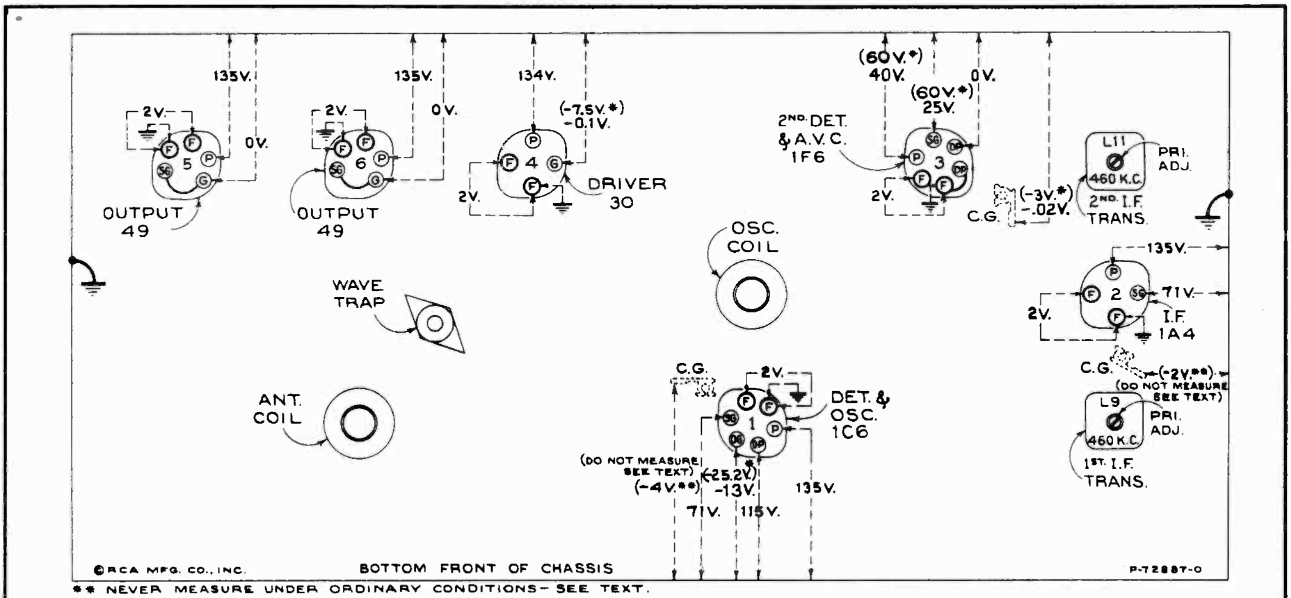


Figure 7—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured with all batteries at normal voltage—Tuned to approximately 1,000 kc ("Standard broadcast")—No signal being received—Volume control optional

Radiotron Socket Voltages

CAUTION: Do not attempt to measure voltages on control grids of RCA-1C6 or RCA-1A4, with any conventional voltmeter, due to presence of bias cells. See "Caution" under "Service data" for method of measuring these cells.

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Use the nearest range above the voltage to be measured.

Power Supply (Models 6BT6 and 6BK6)

The vibrator power unit supplies the necessary plate, grid, and cathode voltages for proper operation of these receivers. It contains a plug-in type vibrator, step-up transformer, and an efficient filter system. Rectification of the high voltage is accomplished by means of the synchronous vibrator. The complete unit is acoustically shielded to prevent noise. The vibrator-power-unit chassis should be insulated from the receiver chassis, when removed for service, to avoid vibrator buzz. The vibrator unit has been carefully adjusted by means of special equipment to insure quiet operation over an extensive period of life. No adjustments should be attempted on a vibrator suspected of being in a defective condition, but a renewal installed. The plug-in arrangement affords easy removal or replacement.

A 6-volt storage battery supplies power for the vibrator and for the tube filaments. Four connections are required to the 6-volt battery. The + 6-volt (black) lead and the + 4-volt (blue) lead supply filament voltage to the receiver, while the + 4-volt (red) lead and — volt (yellow) lead supply voltage to the vibrator power unit. The two 4-volt leads (blue and red) should make separate connections to the same battery strap to avoid against vibrator buzz which might otherwise result if these two leads are joined together or touch each other. The 7½-volt C battery is located on the top-side of the receiver chassis and securely held in place by a metal cover (see figure 3). The four bias cells are located underneath the receiver chassis (see figures 2 and 5).

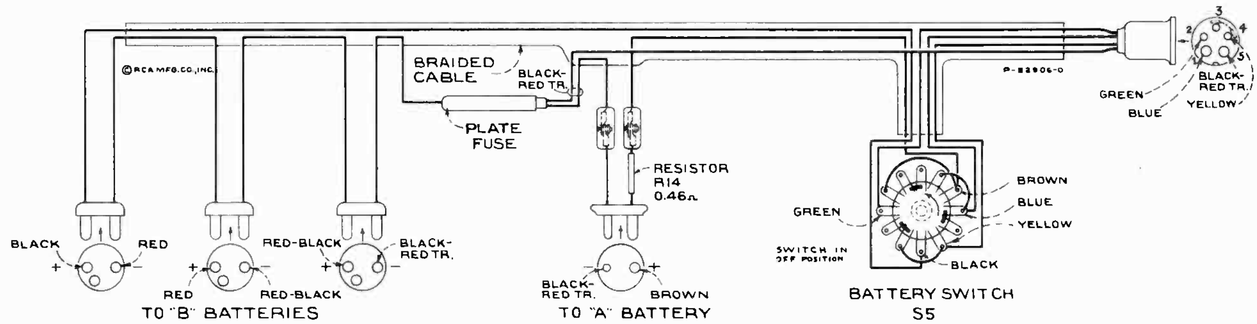


Figure 8—Battery Cable (6BT and 6BK)
(Stock No. 12826)

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12806	Board—3-contact antenna and ground terminal board and bracket, assembled....	$0.25
12717	Board—3-contact phonograph terminal board	.22
5237	Bushing—Variable condenser mounting bushing, assembly—Package of 3.....	.43
12118	Cap—Grid contact cap—Package of 5...	.15
12714	Capacitor—Adjustable trimmer (C5)....	.38
12807	Capacitor—Adjustable trimmer (C2, C7, C8)	.35
12814	Capacitor—5.6 Mmfd. (C40)..........	.20
12723	Capacitor—56 Mmfd. (C39)..........	.20
12629	Capacitor—56 Mmfd. (C16)..........	.20
12813	Capacitor—82 Mmfd. (C10)..........	.20
12404	Capacitor—120 Mmfd. (C15, C18, C19).	.26
12724	Capacitor—120 Mmfd. (C24)..........	.28
12725	Capacitor—150 Mmfd. (C1)..........	.28
12406	Capacitor—180 Mmfd. (C20)..........	.26
12812	Capacitor—450 Mmfd. (C4)..........	.25
12811	Capacitor—3,600 Mmfd. (C3, C6)......	.35
5005	Capacitor—.0035 Mfd. (C25)..........	.16
5107	Capacitor—.0025 Mfd. (C21, C27, C28, C30)	.16
5196	Capacitor—.035 Mfd. (C29)..........	.18

Stock No.	Description	List Price
4836	Capacitor—.05 Mfd. (C9, C17).........	.30
4841	Capacitor—0.1 Mfd. (C23)............	.22
4840	Capacitor—0.25 Mfd. (C14, C22)......	.30
12804	Capacitor—Pack, comprising 2 sections, 8 Mfd. each (C12, C26)............	1.70
12681	Cell—Bias cell......................	.30
12797	Coil—Antenna coil and shield, complete (L1, L2, L3, L4)..................	1.30
12798	Coil—Oscillator coil and shield, complete (L5, L6, L7, L8)..................	1.65
12701	Condenser—2-gang variable tuning condenser (C11, C13)................	4.00
5119	Connector—3-contact female connector for speaker cable..................	.25
12805	Connector—5-contact male receptacle, located on rear of receiver chassis for power cable......................	.20
12800	Core—Adjustable core and stud for Stock No. 12798........................	.20
12006	Core—Adjustable core and stud for Stock Nos. 12801 and 12802.............	.22
12664	Core—Adjustable core and stud for Stock No. 12654........................	.22
12809	Dial—Station selector dial............	.65

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12702	Drive—Vernier drive, complete, for variable tuning condenser	.68
12808	Holder—Bias cell holder	.35
12657	Indicator—Station selector indicator pointer	.20
4348	Lamp—Dial lamp—2-volt	.38
12810	Mask—Dial light diffuser	.15
11647	Resistor—5,600 ohm, carbon type, 1/4 watt—Package of 5 (R2)	1.00
11305	Resistor—22,000 ohm, carbon type, 1/4 watt—Package of 5 (R7)	1.00
11282	Resistor—56,000 ohm, carbon type, 1/10 watt—Package of 5 (R4)	.75
12286	Resistor—56,000 ohm, insulated type, 1/4 watt—Package of 5 (R1)	1.00
11323	Resistor—270,000 ohm, carbon type, 1/4 watt—Package of 5 (R9)	1.00
3033	Resistor—1 meg., carbon type, 1/4 watt—Package of 5 (R6)	1.00
12200	Resistor—1 meg., insulated type, 1/4 watt—Package of 5 (R10)	1.00
11626	Resistor—2.2 meg., carbon type, 1/4 watt—Package of 5 (R8)	1.00
12679	Resistor—2.2 meg., insulated type, 1/4 watt—Package of 5 (R3)	1.00
12651	Shield—Coil shield for Stock No. 12797	.22
12799	Shield—Coil shield for Stock No. 12798	.15
12008	Shield—I. F. transformer shield for Stock Nos. 12801 and 12802	.28
12581	Shield—I. F. transformer shield top for Stock No. 12802	.36
12607	Shield—I. F. transformer shield top for Stock No. 12801	.30
3682	Shield—Radiotron shield	.22
4794	Socket—4-contact 1A4 or 30 Radiotron socket	.15
4814	Socket—5-contact 49 Radiotron socket	.15
4786	Socket—6-contact 1C6 or 1F6 Radiotron socket	.15
11199	Socket—Dial lamp socket	.14
12007	Spring—Retaining spring for core, Stock Nos. 12800, 12006 and 12664—Package of 10	.36
12796	Switch—Range switch (S1)	1.00
12795	Switch—Tone control switch (S2)	.50
12803	Transformer—Audio transformer pack (T1, T2)	3.55
12801	Transformer—1st I. F. transformer, complete (L9, L10, C15, C16)	1.70
12802	Transformer—2nd I. F. transformer, complete (L11, L12, C18, C19, C20, R4)	2.00
12654	Trap—Wave-trap (L19)	.75
11589	Volume Control (R5)	.85

REPRODUCER ASSEMBLIES
Console Model 6BK — 6BK6

Stock No.	Description	List Price
12667	Cone—Reproducer cone and dust cap (L13)	1.00
5118	Plug—3-contact male connector for reproducer	.25
9713	Reproducer—Complete	14.85

REPRODUCER ASSEMBLIES
Table Model 6BT — 6BT6

Stock No.	Description	List Price
12642	Cone—Reproducer cone and dust cap (L13)	.94
5118	Plug—3-contact male connector for reproducer	.25
9712	Reproducer—Complete	6.60

VIBRATOR ASSEMBLIES
6BT6 — 6BK6

Stock No.	Description	List Price
4289	Body—Fuse connector female body—Package of 10	.35
12822	Cable—Power cable (set end), approximately 63 in. long, complete with one 5-contact female connector and one 4-contact male connector—less power switch—Used in Table Model only	4.50
12823	Cable—Power cable (set end), approximately 44 in. long, complete with one 5-contact female connector and one 4-contact male connector—less power switch—Used in Console Model only	4.00
4288	Cap—Fuse connector male cap—Package of 10	.36
4836	Capacitor—.05 Mfd. (C36)	.30
4937	Capacitor—.01 Mfd. (2 used in parallel) (C31, C32)	.25
4841	Capacitor—0.1 Mfd. (C35)	.22
12821	Capacitor—0.1 Mfd. (C38)	.40
12820	Capacitor—0.25 Mfd. (C34)	.45
4840	Capacitor—0.25 Mfd. (C33)	.30
11387	Capacitor—10 Mfd. (C37)	.86
12819	Coil—Vibrator choke coil and terminal board assembly (L17)	.40
12179	Coil—Vibrator choke coil (L15)	.45
12793	Connector—4-contact male connector for power cable	.25
12791	Connector—5-contact female connector and cover for power cable	.30
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10	.38
10907	Fuse—3 amp.—Package of 5 (F1)	.40
4290	Insulator—Fuse connector body insulator—Package of 10	.35
12815	Reactor—Air core reactor (L14)	.80
12818	Reactor—Iron core (L18)	.95
12825	Resistor—4 ohm, flexible type (R13)	.25
5034	Resistor—56 ohm, carbon type, 1/2 watt—Package of 5 (R11, R12)	1.00
4814	Socket—5-contact vibrator socket	.15
4284	Spring—Fuse connector spring—Package of 10	.30
12824	Switch—Power switch (S3, S4)	1.00
12816	Transformer—Vibrator transformer (T3)	3.00
12817	Vibrator—Complete (L16)	4.85
4285	Washer—Fuse connector insulating washer—Package of 10	.22

MISCELLANEOUS ASSEMBLIES

Stock No.	Description	List Price
4289	Body—Fuse connector female body—Package of 10 (6BT-6BK)	.35
12826	Cable—Power cable (set end), approximately 60 in. long, complete with four 2-contact male connectors and one 5-contact female connector—less power switch (6BT-6BK)	5.30
12786	Cable—Power cable (battery section), complete with battery connectors and female section of 4-contact connector (6BT6-6BK6)	2.00
4288	Cap—Fuse connector male cap—Package of 10 (6BT-6BK)	.36
12827	Connector—2-contact and guide pin male connector and cover for power cable (6BT-6BK)	.30
12828	Connector—2-contact male connector for power cable (6BT-6BK)	.20

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price	Stock No.	Description	List Price
12788	Connector—4-volt battery connector for Stock No. 12786—Package of 2 (6BT6-6BK6)	.20	11347	Knob—Volume control, range switch, tone switch or power switch knob—Package of 5	.75
12790	Connector—4-contact female connector for cable, Stock No. 12786	.45	12830	Resistor—0.46 ohm, flexible type—Package of 5 (R14) (6BT-6BK only)	.80
12791	Connector—5-contact female connector and cover for power cable (6BT-6BK)	.30	11377	Screw—Chassis mounting screw assembly for table model only—Package of 4	.12
12787	Connector—6-volt battery connector for Stock No. 12786—Package of 2 (6BT6-6BK6)	.20	11210	Screw—Chassis mounting screw assembly for console model only—Package of 4.	.28
12785	Crystal—Station selector dial escutcheon and crystal	1.00	12789	Screw—Cone point set screw for connector, Stock No. 12788—Package of 10 (6BT6-6BK6 only)	.20
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10 (6BT-6BK)	.38	4284	Spring—Fuse connector spring—Package of 10 (6BT-6BK only)	.30
3748	Fuse—½ amp—Package of 5 (6BT-6BK) (F1)	.40	11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12700—Package of 5.	.25
4290	Insulator—Fuse connector body insulator—Package of 10 (6BT-6BK)	.35	4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
12699	Knob—Station selector knob (large)—Package of 5	.68	12829	Switch—Power switch (6BT-6BK only) (S5)	1.05
12700	Knob—Station selector vernier knob (small)—Package of 5	.58	4285	Washer—Fuse connector insulating washer—Package of 10 (6BT-6BK only)	.22

The prices quoted above are subject to change without notice.

SERVICE HINTS (Models 6BT6 and 6BK6)

(1) Hum or noisy reception will be promoted by poor connection of the blue and red battery leads. These two leads must be kept physically separated as far as possible.

(2) If charging apparatus is associated with the 6BT6—6BK6, a 0.25 mfd. capacitor should be inserted in the receiver ground lead.

First Edition

RCA VICTOR MODELS 6T and 6K

Six-Tube, Two-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges
"Standard broadcast" (A) .... 540-1,820 kc.
"Short wave" (B) .... 1,820-6,600 kc.

Alignment Frequencies
"Standard broadcast" (A) .... 600 kc. (osc.), 1,700 kc. (osc., ant.)
"Short wave" (B) .... None required

Intermediate Frequency .... 460 kc.

Radiotron Complement
(1) RCA-6A8 .... First Det.—Oscillator
(2) RCA-6K7 .... Intermediate Amplifier
(3) RCA-6H6 .... Second Det.—A.V.C.
(4) RCA-6F5 .... Audio Voltage Amplifier
(5) RCA-6F6 .... Power Output
(6) RCA-5Z4 .... Full-wave Rectifier

Pilot Lamps (3) .... Mazda No. 46, 6.3 volts, 0.25 amperes

Power Supply Ratings
Rating A .... 105-125 volts, 50-60 cycles, 80 watts
Rating B .... 105-125 volts, 25-60 cycles, 80 watts
Rating C .... 100-130/140-160/195-250 volts, 40-60 cycles, 80 watts

Power Output Rating
Undistorted .... 2.0 watts
Maximum .... 4.5 watts

Loudspeaker
Type .... Electrodynamic
Voice Coil Impedance .... 2.2 ohms at 400 cycles

Mechanical Specifications

Cabinet Dimensions	Model 6T	Model 6K
Height	19 inches	37½ inches
Width	13⅜ inches	23 inches
Depth	8¾ inches	11 inches
Weights (Net)	22 pounds	43 pounds
Weights (Shipping)	27 pounds	55 pounds

Chassis Base Dimensions .... 12 inches x 7 inches x 2½ inches
Over-all Chassis Height .... 7½ inches
Operating Controls .... (1) Power Switch—Tone, (2) Tuning, (3) Volume, (4) Range Selector
Tuning Drive Ratio .... 10 to 1

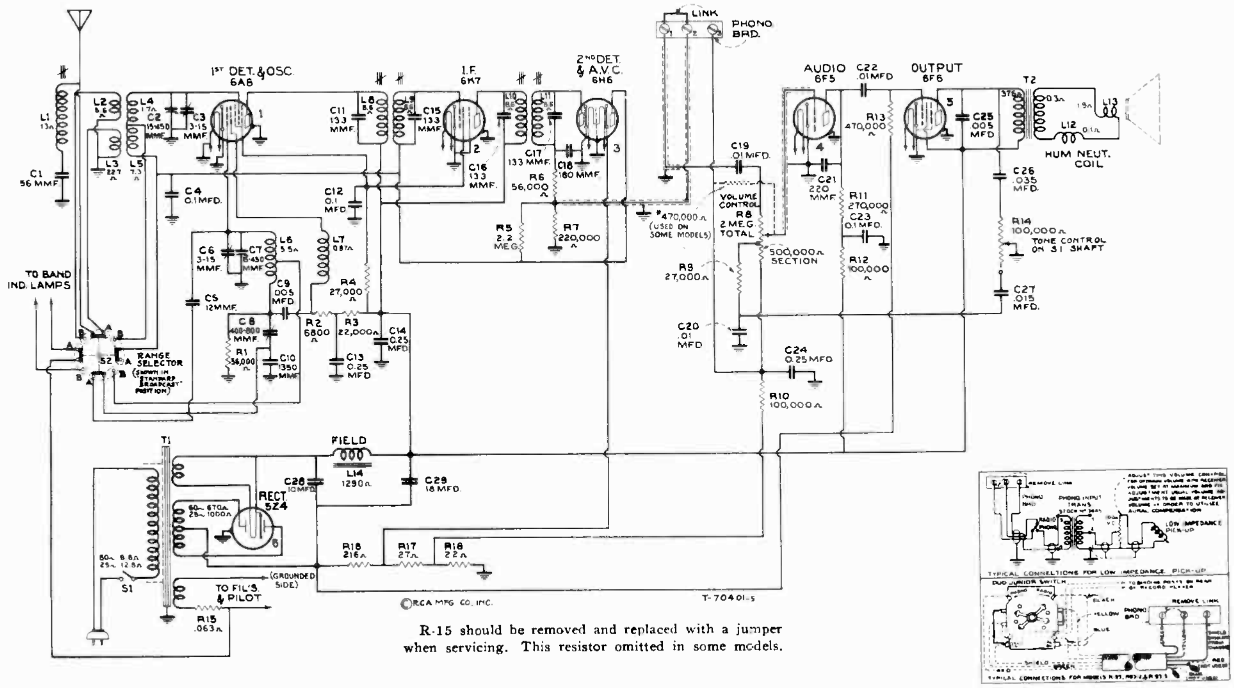
General Features

These receivers employ the same chassis and have many distinctive features. Model 6T employs an 8-inch dynamic loudspeaker and Model 6K employs a 12-inch dynamic loudspeaker. The superheterodyne circuit is used with such features of design as: magnetite core adjusted i-f transformers, improved core adjusted antenna wave-trap, aural compensated volume control, continuously variable tone control with music-voice switch, automatic volume control, resistance coupled audio system, phonograph terminal board, band selective illumination of dial scales, and a dust-proof loudspeaker.

Tuning is continuous through the "Standard broadcast" and "Short wave" bands (including 49 meters). The "Short wave" position of this extensive range also includes channels assigned for police, amateur, and aviation communication. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of ten to one permits ease of tuning, especially in the "Short wave" band.

Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A8. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (magnetite core adjusted) wave-trap is connected across the primary of this transformer to prevent signals of intermediate frequency (460 kc) from being introduced into the first stage as interference. The two-section gang condenser, which tunes the antenna transformer secondary and the heterodyne oscillator coil, has adjustable



R-15 should be removed and replaced with a jumper when servicing. This resistor omitted in some models.

Figure 1—Schematic Circuit Diagram

(* 470,000-ohm resistor not required when replacing volume control with Stk. No. 13144)

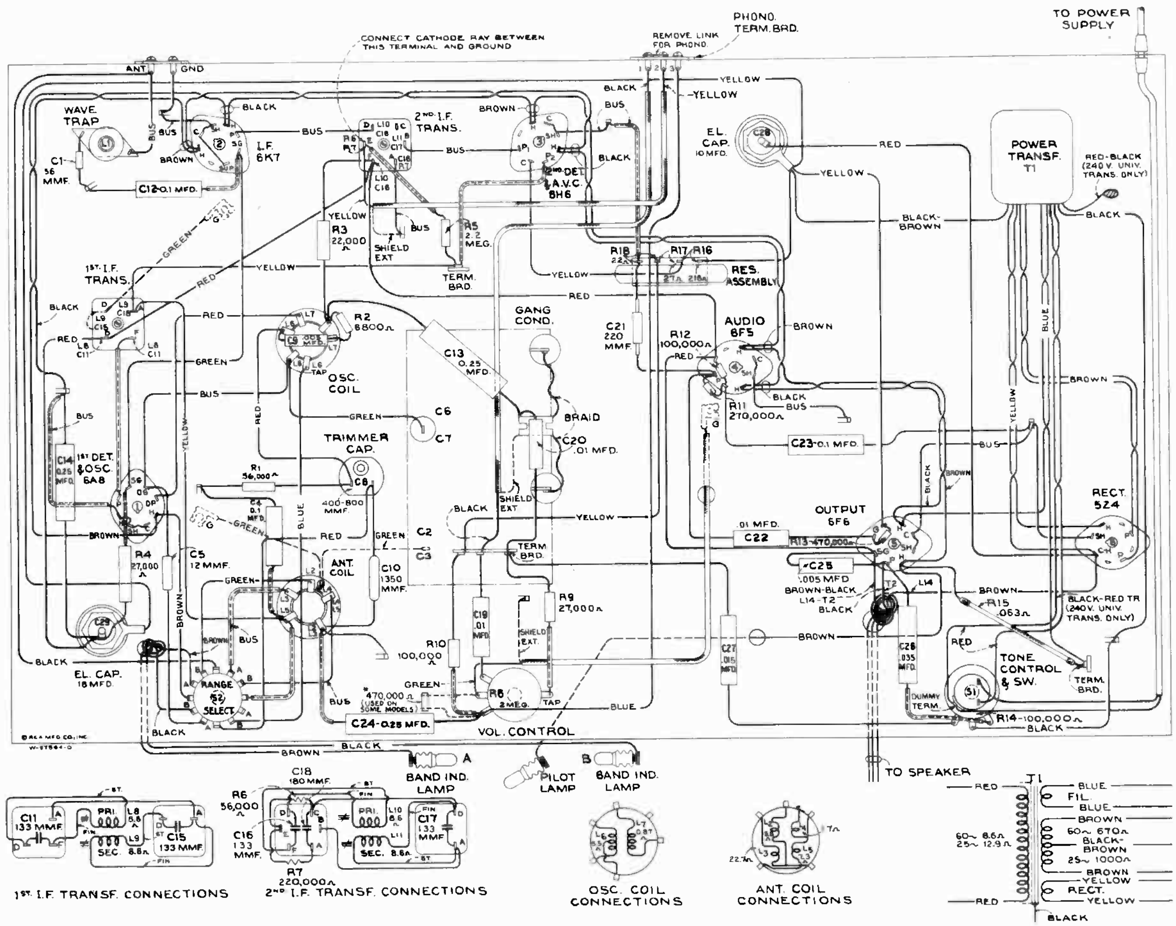


Figure 2—Chassis Wiring Diagram

trimmers for obtaining exact alignment. Each of these coils is tapped so that the range switch increases the range of tuning by decreasing the amount of inductance.

The intermediate-frequency stage is coupled to the RCA-6A8 and to the RCA-6H6 by means of tuned transformers. These transformers resonate with fixed capacitors and are adjusted by molded magnetite cores to tune to **460 kc.**

The modulated signal, as obtained from the output of the i-f system, is detected by one of the diodes of the RCA-6H6 tube. Audio frequency secured by this process is passed on to the control grid of the RCA-6F5 for amplification before final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R7, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter. The second diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This auxiliary diode, under such conditions, draws current which flows through resistors R5 and R7, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-6F5, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-6F6 power-output stage, which, in turn, is transformer-coupled to the dynamic speaker.

Continuously variable tone control is effected by means of capacitor C26 and variable resistor R14 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R14 from the circuit and places an additional capacitor C27 in shunt with capacitor C20, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

The power-supply system consists of an RCA-5Z4 rectifier tube which is supplied from an efficiently designed power transformer and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits are obtained from the output of the filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings

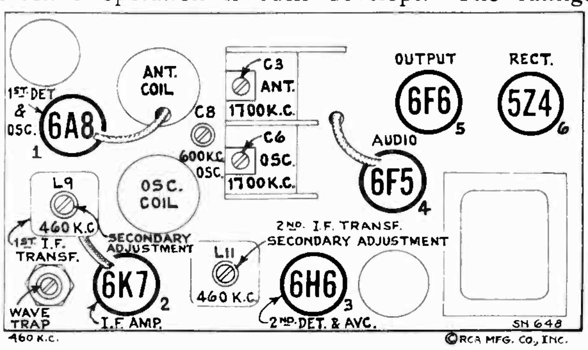


Figure 3—Radiotron, Coil, and Trimmer Locations

of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R3, L2, C1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Ratings of less than one ohm are generally omitted.

Alignment Procedure

There are three alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of screws attached to molded magnetite cores. All of these circuits have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions or altered during servicing. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available, for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation.

A test oscillator, such as the **RCA Stock No. 9595**, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the **RCA Stock No. 4317 Neon Output Indicator.**

The procedure outlined below should be followed in adjusting the various trimmer capacitors and molded cores:

I-F Core Adjustments

The four adjustment screws (attached to molded magnetite cores) of the two i-f transformers (one on top and one on bottom of each i-f transformer) are located as shown by figures 3 and 7. Each circuit must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the loudspeaker voice coil.

Connect the output of the test oscillator to the control grid of the RCA-6A8 through a **.05 mfd.** capacitor. Connect the test oscillator ground terminal to the ground terminal of the receiver chassis. Range selector should be in "Short wave" position. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point, within its range, where no interference is encountered either from local broadcast stations or from the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is present on the output indicator. Adjust the two magnetite core screws of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two magnetite core screws of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustment.

Wave-Trap Adjustment

Attach the output of the test oscillator to the receiver "Antenna" terminal through a **200 mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to **460 kc** and range selector in "Short wave" position as before. Then adjust the wave-trap screw to the point which causes maximum suppression of the 460 kc signal.

R-F Trimmer Adjustments

Calibrate the tuning dial by setting the pointer to a horizontal position (53 on "Standard broadcast" scale) with the two-gang tuning condenser in full mesh. The output indicator should be left connected to the system. Connections for the test oscillator remain the same as for "Wave-trap adjustment." Adjust the test oscillator to **1,700 kc** and set the receiver tuning control to a dial reading of **1,700 kc.** Leave the volume control of the receiver at its maximum position. Make sure that the range selector is at its broadcast position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimmers, **C6** and **C3**, of the oscillator and antenna transformer coils (mounted on the variable condenser) so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator to **600 kc.** Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then, adjust the receiver oscillator series trimmer, **C8,** simultaneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at 1,700 kc should then be repeated to correct for any change which may have been caused by the oscillator series trimmer adjustment.

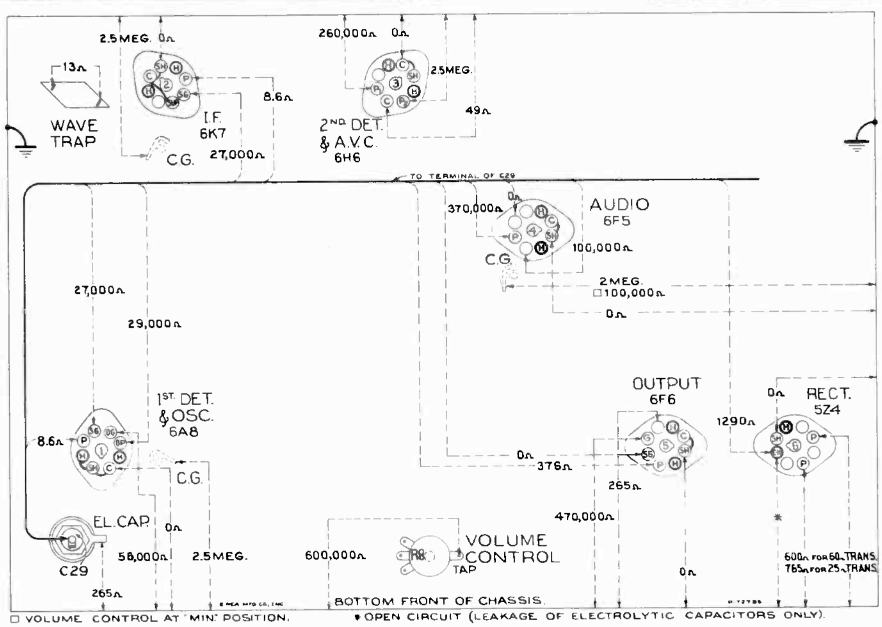


Figure 4—Resistance Diagram

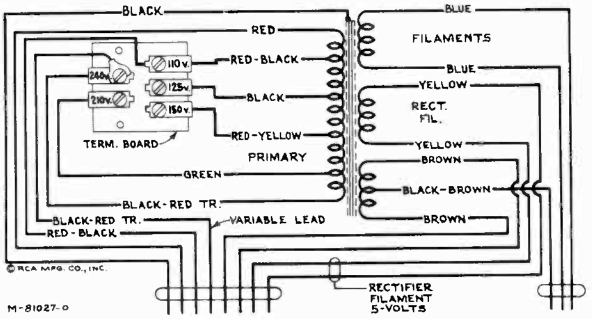
Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—Volume control maximum

Resistance Measurement

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with the Radiotrons in sockets; tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical



Primary Resistance—24.5 ohms Total
Secondary Resistance—668 ohms Total

Figure 5—Universal Transformer

methods of connecting a low-impedance pick-up, or the RCA Victor Models R-93, R-93-2, and R-93S Record Players are shown on the schematic diagram (figure 1).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers

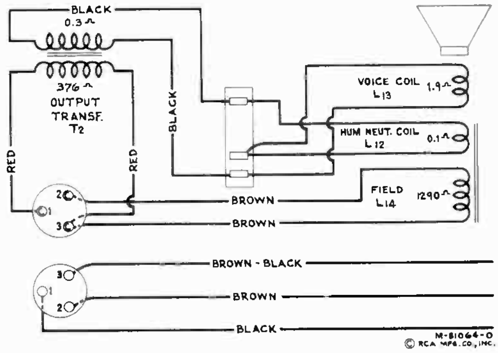


Figure 6—Loudspeaker Wiring

after first removing the front paper dust cover. This may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

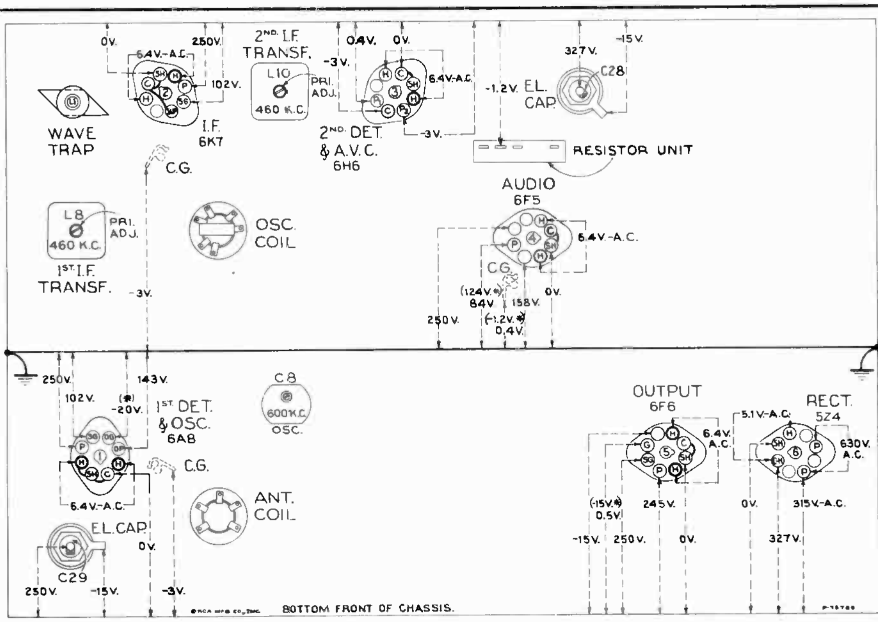


Figure 7—Radiotron Socket Voltages, Coil and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc. ("Standard broadcast")—No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc, no signal being received, and volume control set at minimum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing — Variable condenser mounting bushing assembly—Package of 3	$0.43
12511	Cap—Grid contact cap—Package of 5	.15
11465	Capacitor—Adjustable capacitor (C8)	.48
12659	Capacitor—12 Mmfd. (C5)	.20
12661	Capacitor—56 Mmfd. (C1)	.20
12946	Capacitor—133 Mmfd. (C11, C15, C16, C17)	.20
12406	Capacitor—180 Mmfd. (C18)	.26
12662	Capacitor—220 Mmfd. (C21)	.20
12660	Capacitor—1,350 Mmfd. (C10)	.28
4868	Capacitor—.005 Mfd. (C9, C25)	.20
11315	Capacitor—.015 Mfd. (C27)	.20
12670	Capacitor—.035 Mfd. (C26)	.20
4858	Capacitor—.01 Mfd. (C19, C20, C22)	.25
4841	Capacitor—0.1 Mfd. (C4, C23)	.22
11414	Capacitor—0.1 Mfd. (C12)	.20
4840	Capacitor—0.25 Mfd. (C13, C24)	.30
5170	Capacitor—0.25 Mfd. (C14)	.25
11240	Capacitor—10 Mfd. (C28)	1.08
5212	Capacitor—18 Mfd. (C29)	1.16
12648	Coil—Antenna coil less shield (L2 L3, L4, L5)	1.35
12649	Coil—Oscillator coil less shield (L6, L7)	1.20
12643	Condenser—2-gang variable tuning condenser (C2, C3, C6, C7)	3.46
5119	Connector—3-contact female speaker cable connector	.25
12006	Core—Adjustable core and stud for I.F. transformer, Stock Nos. 12652 and 12653	.22
12664	Core—Adjustable core and stud for wave trap, Stock No. 12654	.22
12658	Dial—Station selector dial	.65
12656	Drive—Variable condenser drive shaft and pinion	.58
12655	Gear—Large gear located on variable condenser shaft	.34
12657	Indicator—Station selector indicator	.20
5226	Lamp—Dial lamp—Package of 5	.70
12663	Mask—Dial light diffuser, complete with red and green colored screen	.30
12647	Range Switch (S2)	.68
11454	Resistor—6,800 ohm, carbon type, 1/4 watt—Package of 5 (R2)	1.00
8070	Resistor—22,000 ohm, carbon type, 1/2 watt—Package of 5 (R3)	1.00
11400	Resistor—27,000 ohm, carbon type, 1/4 watt—Package of 5 (R9)	1.00
12011	Resistor—27,000 ohm, carbon type, 1 watt—Package of 5 (R4)	1.10
5029	Resistor—56,000 ohm, carbon type, 1/4 watt—Package of 5 (R1)	1.00
11282	Resistor—56,000 ohm, carbon type, 1/10 watt—Package of 5 (R6)	.75
12263	Resistor—100,000 ohm, insulated, 1/4 watt—Package of 5 (R12)	1.00
3118	Resistor—100,000 ohm, carbon type, 1/4 watt—Package of 5 (R10)	1.00
11398	Resistor—220,000 ohm, carbon type, 1/10 watt—Package of 5 (R7)	.75
11453	Resistor—270,000 ohm, carbon type, 1/10 watt—Package of 5 (R11)	.75
11452	Resistor—470,000 ohm, carbon type, 1/10 watt—Package of 5 (R13)	.75
11626	Resistor—2.2 megohm, carbon type, 1/4 watt—Package of 5 (R5)	1.00
12004	Resistor—Voltage divider resistor — Comprising one 216 ohm, one 27 ohm and one 22 ohm sections (R16, R17, R18)	.45
12008	Shield—First or second I.F. transformer shield	.28
12650	Shield—Antenna coil shield	.22
12735	Shield—Dial lamp shield—Package of 5	.25
12607	Shield—First I.F. transformer shield top	.30
12651	Shield—Oscillator coil shield	.22
12581	Shield—Second I.F. transformer shield top	.36
11199	Socket—Dial lamp socket	.14
11195	Socket—5-contact 5Z4 radiotron socket	.15
11198	Socket—7-contact 6F5, 6H6 or 6K7 radiotron socket	.15
11196	Socket—8-contact 6A8 or 6F6 radiotron socket	.15
12007	Spring—Retaining spring for core Stock No. 12006 and 12664—Package of 10	.36
12668	Tone Control and Switch (R14, S1)	1.22
13106	Transformer—First I.F. transformer, complete (L8, L9, C11, C15)	1.60
11999	Transformer—Power transformer, 105-125 volt, 50-60 cycle (T1)	3.80
12132	Transformer—Power transformer, 105-125 volt, 25-50 cycle (T1)	5.48
12133	Transformer—Power transformer, 100-250 volt, 40-60 cycle (T1)	6.25
13107	Transformer—Second I. F. transformer, complete (L10, L11, C16, C17, C18, R6, R7)	2.06
12654	Trap—Wave trap (L1)	.75
13144	Volume Control (R8)	1.00
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board	.15
12640	Bracket — Output transformer mounting bracket and clamp	.18
12012	Coil—Field coil (L14)	1.85
11469	Coil—Neutralizing coil (L12)	.20
12642	Cone—Reproducer cone and dust cap (L13) (Model 6T)	.94
12667	Cone—Reproducer cone and dust cap (L13) (Model 6K)	1.00
5118	Connector—3-contact male speaker cable connector	.25
12666	Cover—Speaker cover (Model 6K)	.65
9696	Reproducer complete (Model 6K)	6.90
9699	Reproducer complete (Model 6T)	6.38
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
12639	Escutcheon—Station selector escutcheon and crystal	1.02
12638	Knob—Station selector knob — Package of 5	.58
11582	Knob—Tone control knob—Package of 5	.50
11347	Knob—Volume control or range switch knob—Package of 5	.75
11586	Screw—Receiver mounting screw No. 14x1 in.—Package of 10	.22
11349	Spring—Retaining spring for knob, Stock Nos. 11347, 11582, and 12638—Package of 5	.25

Prices quoted above are subject to change without notice.

First Edition

RCA VICTOR MODELS 6K1, 7X1, and 8K1

TECHNICAL INFORMATION AND SERVICE DATA

MODEL 6K1

This receiver is similar to Model 6K except for minor changes which include: (1) An RCA-5W4 rectifier used in place of the RCA-5Z4. (2) The .063-ohm heater resistor (R15) is omitted. (3) A three-point tone control (S3) used in place of the variable tone control (R14). (4) Different power transformers.

The tone control (S3) is connected as follows: Viewing tone control from rear and starting from counter-clockwise lug, lug 1 connects to a .017 mfd. capacitor (C30), the other side of this capacitor (C30) connects to chassis. Lug 2 connects to the junction of capacitor (C20) and resistor (R9). Lug 3 is not used. Lug 4 connects direct to the plate contact of socket No. 5.

The d-c resistance of the power transformers are: No. 12644, Pri. 8.6 ohms, Sec. 745 ohms. No. 12645, Pri. 12.9 ohms, Sec. 1120 ohms. No. 12646, Pri. 24.5 ohms, Sec. 760 ohms. The voltages for the RCA-5W4 rectifier are: Plate to plate, 692 volts. Either plate to chassis-ground, 346 volts. All other voltages remain the same.

All Service Data for Model 6K are directly applicable to these receivers except the changes stated above and the Replacement Parts listed **below.**

Stock No.	Description
12930	Board--Antenna and ground terminal board
12717	Board--Phonograph terminal board
11451	Capacitor--.017 Mfd. (C30)
13918	Dial--Station Selector dial
5145	Resistor--100,000 ohms, carbon type, 1/4 watt (R10)
11195	Socket--5-contact 5W4 Radiotron socket
13681	Tone control and power switch (S1, S3)
12644	Transformer--Power transformer, 105-125 volts, 50-60 cycles (T1)
12645	Transformer--Power transformer, 105-125 volts, 25-60 cycles (T1)
12646	Transformer--Power transformer, 100-130/140-160/195-250 volts, 40-60 cycles (T1)
11347	Knob--Tone control knob

Stock Nos. 11315, 12670, 12658, 12669, 3118, 12668, 11999, 12132, 12133, and 11582 are not used in Model 6K1.

MODEL 7X1

This receiver is identical to Model 7X except for cabinet design. All Service Data for Model 7X are directly applicable to these receivers except the Replacement Parts listed below.

Stock No.	Description
14136	Dial--Station selector dial scale
13683	Mask--Dial light diffuser complete with colored screen
14171	Socket--Dial lamp socket
13866	Cap--Reproducer cone dust cap
9712	Reproducer complete less output transformer and bracket

Stock Nos. 12996, 12718, 3529, and 9717 are not used in Model 7X1.

MODEL 8K1

This receiver is identical to Model 8K except for cabinet design. All Service Data for Model 8K are directly applicable to these receivers except the Replacement Parts listed below.

Stock No.	Description
13993	Dial--Station selector dial scale
13683	Mask--Dial light diffuser with colored screens
13615	Bracket--Tuning tube mounting bracket and clamp

Stock Nos. 12703, 12718, and 11996 are not used in Model 8K1.

SERVICE DIVISION
RCA Manufacturing Company, Inc.
Camden, N. J., U. S. A.

RCA VICTOR MODELS 6T2 AND 6K2

Six-Tube, Three-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges

"Standard broadcast" (A)	540- 1,625 kc.
"Medium wave" (B)	1,625- 5,700 kc.
"Short wave" (C)	5,700-18,000 kc.

Alignment Frequencies

"Standard broadcast" (A)	600 kc. (osc.), 1,400 kc. (osc. and ant.)
"Medium wave" (B)	None required
"Short wave" (C)	15,000 kc. (osc. and ant.)

Intermediate Frequency .... 460 kc.

Radiotron Complement

(1)	RCA-6A8	First-detector–oscillator
(2)	RCA-6K7	Intermediate amplifier
(3)	RCA-6H6	Second-detector–a.v.c.
(4)	RCA-6F5	Audio voltage amplifier
(5)	RCA-6F6	Audio power amplifier
(6)	RCA-5Z4	Full-wave rectifier

Pilot Lamps (5) .... Mazda No. 46, 6.3 volts, 0.25 amperes

Power Supply Ratings

Rating A	105-125 volts, 50-60 cycles, 90 watts
Rating B	105-125 volts, 25-60 cycles, 90 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 90 watts

Power Output

Undistorted	2.0 watts
Maximum	4.5 watts

Loudspeaker

Type	Electrodynamic
Impedance (v.c.)	2.2 ohms at 400 cycles

Mechanical Specifications

	Model 6T2	Model 6K2
Height	19⅞ inches	38 inches
Width	13¾ inches	23⅛ inches
Depth	8½ inches	11⅛ inches
Weight (net)	24 pounds	46 pounds
Weight (shipping)	29 pounds	58 pounds

Chassis Base Dimensions .... 12 inches x 7 inches x 2½ inches
Over-all Chassis Height .... 8 inches
Operating Controls .... (1) Power switch–tone, (2) Tuning, (3) Volume, (4) Range selector
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

These receivers employ the same chassis and have many distinctive features. Model 6T2 employs an 8-inch dynamic loudspeaker and Model 6K2 employs a 12-inch dynamic loudspeaker. The superheterodyne circuit is used with such features of design as: Antenna wave-trap, aural compensated volume control, continuously variable tone control with music-voice switch, automatic volume control, resistance coupled audio system, phonograph terminal board, and band selective indication of dial scales. The tuning range is continuous through the "Standard broadcast" band, "Medium wave" band, and the "Short wave" band. It includes domestic broadcast, police, aircraft and amateur services, and also the important foreign short-wave broadcast bands at 49, 31, 25, 19, and 16 meters.

Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A8. The input of this tube is coupled to the antenna through a tuned transformer. This transformer consists of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range-selector switch S3 is used for connecting the various sections of these two coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable two-section gang condenser having trimming capacitors in shunt with each

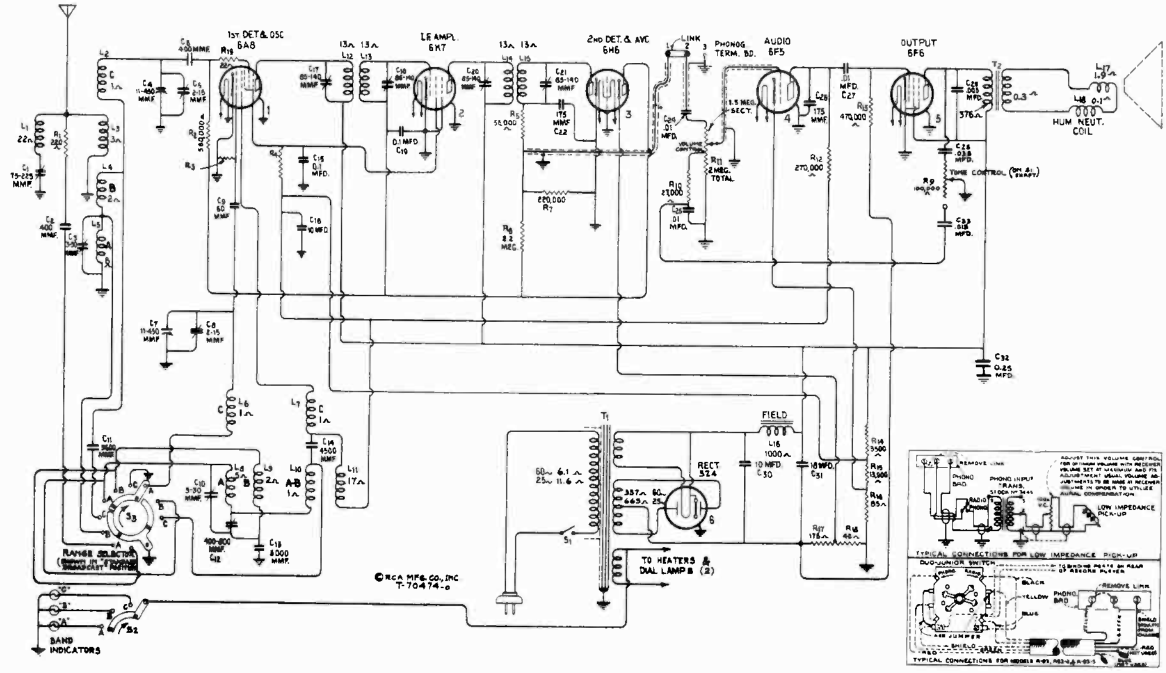


Figure 1—Schematic Circuit Diagram

R3, 56,000 ohms
R4, 22,000 ohms

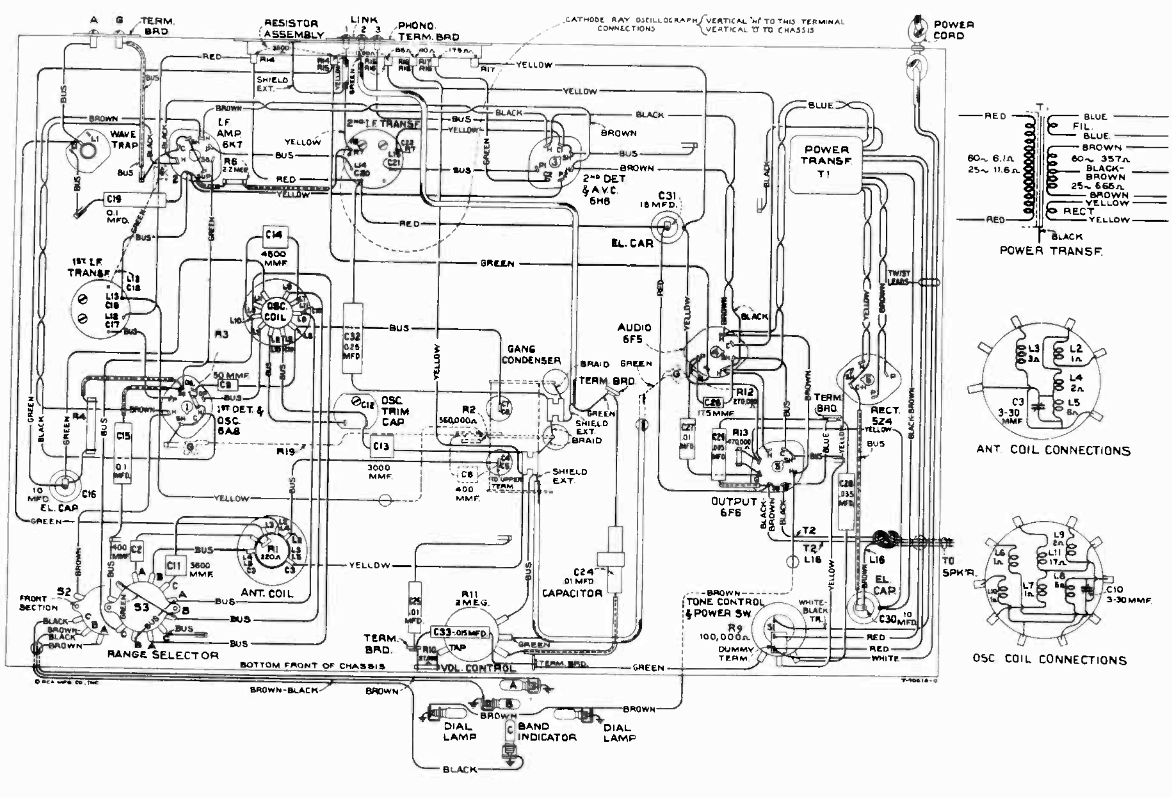


Figure 2—Chassis Wiring Diagram

section. There are additional trimming capacitors across the section of each coil used for the "Standard broadcast" band. A series trimming capacitor is also associated with the "Standard broadcast" oscillator coil.

The intermediate-frequency stage is coupled to the RCA-6A8 and to the RCA-6H6 by means of tuned transformers. The windings of these transformers (both primary and secondary) are resonated with adjustable trimming capacitors to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 twin-diode tube. Audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage which develops across resistor R7 is applied as automatic control-grid bias to the first detector and i-f tubes. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R6 and R7, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current, and the a.v.c. diode takes over the biasing function.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first-audio control grid. After amplification by the RCA-6F5, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-6F6 power-output stage, which, in turn, is transformer-coupled to the dynamic loudspeaker.

Continuously variable tone control is effected by means of the combination of a capacitor C28 and variable resistor R9 shunting the plate circuit of the output tube. Extreme clockwise rotation of the tone control disconnects the resistor R9 from the circuit and places an additional capacitor, C33, in shunt with capacitor C25, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

The power-supply system consists of an RCA-5Z4 rectifier tube, which is supplied from an efficiently designed power transformer, and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits, are obtained from the output of the filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

SERVICE DATA

Alignment Procedure

There are six adjustments required for the alignment of the antenna, oscillator, and wave-trap tuned circuits. The i-f transformer adjustments are made by four trimming capacitor screws. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

A standard test oscillator, such as the **RCA Stock No. 9595,** will be required as a source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Glow Indicator** is designed for this purpose.

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output control so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

(a) Connect the test oscillator to the grid cap of the RCA-6A8 through a **.001 mfd.** capacitor, and connect the test oscillator ground to the receiver chassis. Set test oscillator to **460 kc.**

(b) Adjust the two trimming capacitors **(C20** and **C21)** of the second i-f transformer to produce maximum (peak) output.

(c) Adjust the two trimming capacitors **(C17** and **C18)** of the first i-f transformer, to produce maximum (peak) output.

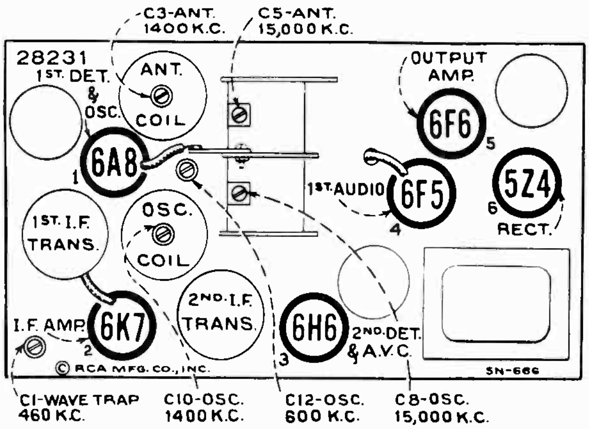


Figure 3—Radiotron, Coil, and Trimmer Locations

It is advisable to repeat the adjustment of all i-f trimming capacitors a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme end calibration mark (beyond

55 on dial) while the two-gang tuning condenser plates are in full mesh. Alignment (see figure 3 for location of trimming adjustments) of "Wave-trap," "Short wave" band and "Standard broadcast" band should be made in the following order and sequence.

"Wave-Trap"

(a) Connect the output of the test oscillator to the antenna terminal through a **200 mmfd. (important)** capacitor, leaving the test oscillator ground connected to the receiver chassis. With the range selector in its "Standard broadcast" position, set the receiver dial to position of no extraneous signals, near **600 kc.** (60 on dial). Set the test oscillator to **460 kc.** Adjust the wave-trap trimming capacitor **C1** to a point which causes minimum amplitude of output. An increase of the test oscillator output may be necessary before the point of minimum amplitude, obtained by adjustment of wave-trap screw, becomes apparent on the output indicator.

"Short Wave" Band

(a) Connect the output of the test oscillator to the antenna terminal through a **300-ohm** resistor, leaving the test oscillator ground connected as before.

(b) Set the range selector to its "Short wave" position. Set receiver dial pointer to **15,000 kc. (15** on dial). Adjust the test oscillator to **15,000 kc.** Adjust the oscillator trimming capacitor **C8** to the point which produces maximum (peak) output. Two points may be found, each of which produces a maximum. The one of maximum trimmer capacitance (most clockwise) is correct and should be used.

(c) Adjust the antenna trimming capacitor **C5** of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **15,000 kc.** input signal, until maximum (peak) output results from these combined operations.

"Standard Broadcast" Band

(a) Connect the output of the test oscillator to the antenna terminal through a **200 mmfd.** capacitor, leaving test oscillator ground connected as before.

(b) Set the range selector to its "Standard broadcast" position. Set the receiver dial pointer to **1,400 kc. (140** on dial). Adjust the test oscillator to **1,400 kc.** Adjust the oscillator and antenna trimming capacitors, **C10** and **C3** respectively, to the points where each produces maximum (peak) output.

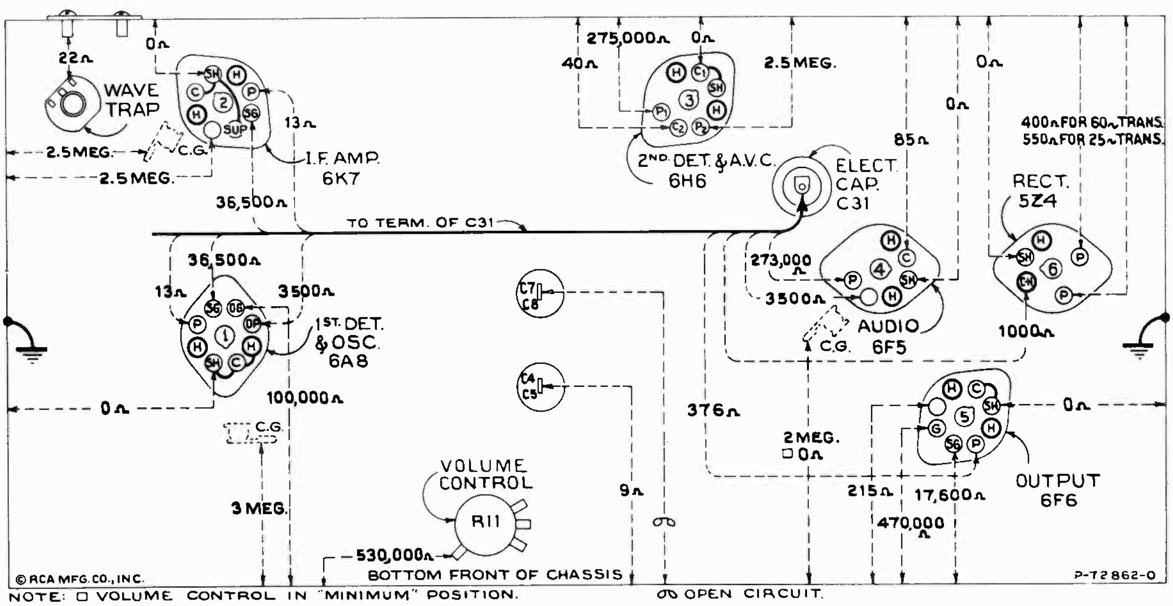
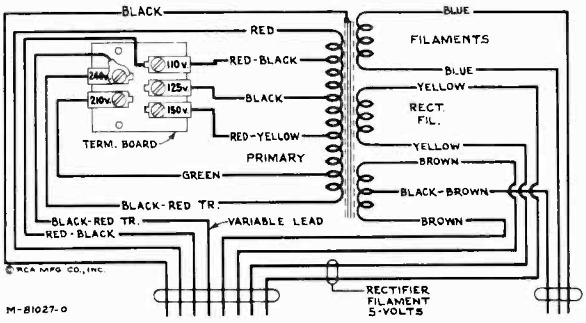


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh—Range selector "Standard broadcast"—Volume control maximum

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with Radiotrons in sockets, tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

(c) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.



Primary Resistance—17.3 ohms total
Secondary Resistance—355 ohms total

Figure 5—Universal Transformer

(d) Adjust the low-frequency oscillator trimming capacitor, C12, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum (peak) output results from these combined operations. Repeat adjustments in (b) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimming capacitor.

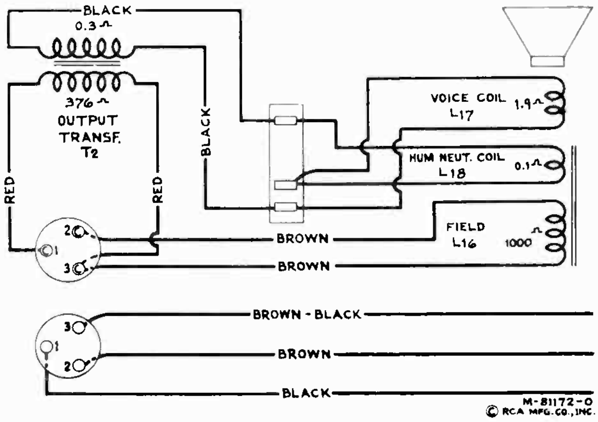


Figure 6—Loudspeaker Wiring

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the schematic diagram (figure 1).

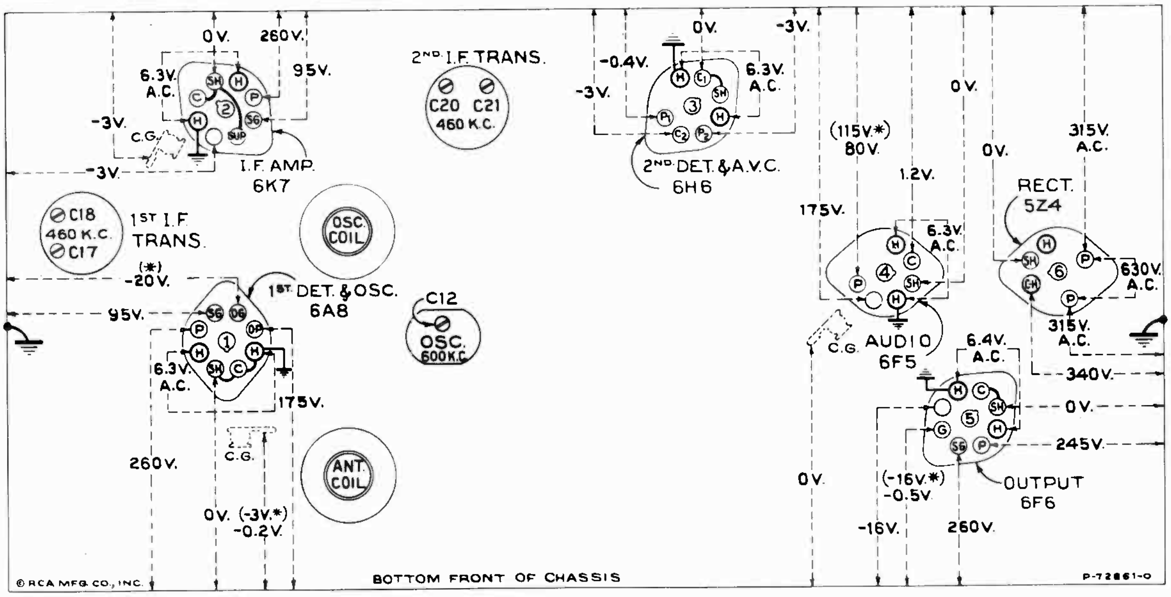


Figure 7—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc. ("Standard broadcast")—No signal being received—Volume control minimum

***Note:** Two voltage values are shown for some readings. The higher value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause of faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc., no signal being received, and volume control set at minimum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12930	Board—Antenna and ground terminal board	$0.20
12717	Board—Phonograph terminal board	.22
12772	Bracket—Top dial lamp socket bracket	.30
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	.43
11350	Cap—Grid contact cap used on resistor—Stock No. 11624—Package of 5	.20
12511	Cap—Grid contact cap—Package of 5	.15
11465	Capacitor—Adjustable capacitor—(C12)	.48
11289	Capacitor—50 Mmfd.—(C9)	.26
11623	Capacitor—175 Mmfd.—(C22, C26)	.18
11290	Capacitor—400 Mmfd. (C2, C6)	.25
11622	Capacitor—3000 Mmfd.—(C13)	.36
11621	Capacitor—3600 Mmfd.—(C11)	.38
11287	Capacitor—4500 Mmfd.—(C14)	.30
4868	Capacitor—.005 Mfd.—(C29)	.20
11395	Capacitor—.01 Mfd.—(C24)	.18
4858	Capacitor—.01 Mfd.—(C25, C27)	.25
11315	Capacitor—.015 Mfd.—(C33)	.20
12670	Capacitor—.035 Mfd.—(C28)	.20
4841	Capacitor—0.1 Mfd.—(C19)	.22
11414	Capacitor—0.1 Mfd.—(C15)	.20
5170	Capacitor—0.25 Mfd.—(C32)	.25
11387	Capacitor—10 Mfd.—(C16)	.86
11240	Capacitor—10 Mfd.—(C30)	1.08
5212	Capacitor—18 Mfd.—(C31)	1.16
11617	Coil—Antenna coil less shield—(L2, L3, L4, L5, C3, R1)	1.68
11618	Coil—Oscillator coil less shield—(L6, L7, L8, L9, L10, L11, C10)	2.22
12767	Condenser—2-gang variable tuning condenser—(C4, C5, C7, C8)	4.10
5119	Connector—3-contact female connector for speaker cable	.25
12792	Dial—Station selector dial	.85
12768	Drive—Variable tuning condenser vernier drive	1.30
11619	Foot—Chassis mounting foot and bracket—Package of 2	.65
12770	Holder—Dial scale holder and lamp bracket assembly less bracket for top dial lamp socket	.55
12712	Indicator—Station selector indicator pointer	.22
5226	Lamp—Dial lamp—6.3 volt—Package of 5	.70
12718	Mask—Dial light diffuser complete with red, orange and green-colored screen	.40
11466	Resistor—Voltage divider resistor—comprising one 3,500-ohm, one 13,000-ohm, one 85-ohm, one 40-ohm and one 175-ohm sections—(R14, R15, R16, R17, R18)	.95
11624	Resistor—22 ohms—Flexible type complete with grid contact cap—(R19)	.22
11620	Resistor—220 ohms—Carbon type—1/10 watt—(R1)—Package of 5	.75
8070	Resistor—22,000 ohms—Carbon type—½ watt—(R4)—Package of 5	1.00
11400	Resistor—27,000 ohms—Carbon type—¼ watt—(R10)—Package of 5	1.00
11282	Resistor—56,000 ohms—Carbon type—1/10 watt—(R5)—Package of 5	.75
12286	Resistor—56,000 ohms—Insulated—¼ watt—(R3)—Package of 5	1.00
11398	Resistor—220,000 ohms—Carbon type—1/10 watt—(R7)—Package of 5	.75
11453	Resistor—270,000 ohms—Carbon type—1/10 watt—(R12)—Package of 5	.75
11452	Resistor—470,000 ohms—Carbon type—1/10 watt—(R13)—Package of 5	.75
11397	Resistor—560,000 ohms—Carbon type—1/10 watt—(R2)—Package of 5	$0.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R6)—Package of 5	1.00
11390	Shield—I. F. transformer shield for Stock Nos. 11388 and 11389	.25
11603	Shield—Coil shield for Stock Nos. 11617 and 11618	.26
12735	Shield—Dial lamp shield—Package of 5	.25
12771	Socket—Dial lamp socket—Located at top of dial scale	.25
11199	Socket—Dial lamp socket	.14
11195	Socket—5-contact 5Z4 Radiotron socket	.15
11198	Socket—7-contact 6F5, 6H6 Radiotron socket	.15
11196	Socket—8-contact 6A8, 6F6 or 6K7 Radiotron socket	.15
12769	Switch—Range switch—(S2, S3)	1.25
12668	Tone Control—Control and power switch—(R9, S1)	1.22
11388	Transformer—First I. F. transformer less shield—(L12, L13, C17, C18)	1.90
11848	Transformer—Power transformer—105-125-volt, 50-60-cycle—(T1)	4.40
11849	Transformer—Power transformer—105-125-volt, 25-40-cycle—(T1)	5.70
11850	Transformer—Power transformer—105-250-volt, 40-60-cycle—(T1)	8.00
11389	Transformer—Second I. F. transformer less shield—(L14, L15, C20, C21, C22, R5, R7)	3.02
11391	Trap—Wave trap—(L1, C1)	1.22
13144	Volume control—(R11)	1.00
	REPRODUCER ASSEMBLIES	
11232	Board—Reproducer terminal board	.18
8060	Bracket—Output transformer mounting bracket and clamp	.14
11470	Coil—Field coil—(L16)	2.16
11469	Coil—Neutralizing coil—(L18)	.20
11235	Cone—Reproducer cone complete—(L17)—(Model 6T2)	1.00
11258	Cone—Reproducer cone complete—(L17)—(Model 6K2)	1.00
5118	Connector—3-contact male connector for speaker cable	.25
12666	Cover—Speaker cover (Model 6K2)	.65
9621	Reproducer complete (Model 6T2)	6.85
9622	Reproducer complete (Model 6K2)	7.16
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
12698	Crystal—Station selector crystal and escutcheon	1.02
11582	Knob—Range switch knob—Package of 5	.50
11610	Knob—Station selector knob—includes large and small knob—Package of 5	1.00
11347	Knob—Tone control or volume control knob—Package of 5	.75
11377	Screw—Chassis mounting screw assembly used on Model 6T2—Package of 4	.12
11210	Screw—Chassis mounting screw assembly—Used on Model 6K2—Package of 4	.28
11349	Spring—Retaining spring for knob—Stock No. 11347, No. 11582 and small knob of Stock No. 11610—Package of 5	.25
4982	Spring—Retaining spring for large knob of Stock No. 11610—Package of 10	.50

First Edition.

Prices quoted above are subject to change without notice.

RCA VICTOR MODEL 6K2 (Second Production)

WITH MAGNETITE CORE I-F TRANSFORMERS

TECHNICAL INFORMATION AND SERVICE DATA

These receivers are similar to Model 6K2 (first production) except for the i-f transformers, loudspeaker, and a few component parts. Visual inspection of the i-f transformers will readily identify these receivers. Service Data for Model 6K2 are directly applicable to these receivers except the information contained herein. The primary adjustments for the i-f transformers are located on the bottom of the transformers while the secondary adjustments are located on top.

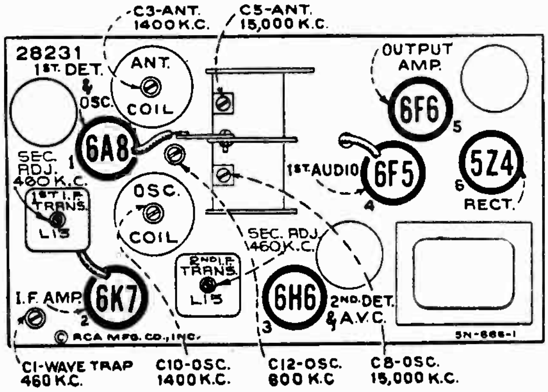


Figure 1—Radiotron, Coil, and Trimmer Locations (Model 6K2, Second Production)

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION
	RECEIVER ASSEMBLIES
12930	Board—Antenna and ground terminal board.
12717	Board—Phonograph terminal board.
12772	Bracket—Top dial lamp socket bracket.
5237	Bushing—Variable tuning condenser mounting bushing assembly.
11350	Cap—Grid contact cap used on resistor—Stock No. 11624.
12511	Cap—Grid contact cap.
11256	Capacitor—Adjustable trimmer—(C1).
11465	Capacitor—Adjustable trimmer—(C12).
11289	Capacitor—50 Mmfd.—(C9).
12946	Capacitor—133 Mmfd.—(C17, C18, C20, C21).
11623	Capacitor—175 Mmfd.—(C26).
12406	Capacitor—180 Mmfd.—(C22).
11290	Capacitor—400 Mmfd.—(C2, C6).
11622	Capacitor—3000 Mmfd.—(C13).
11621	Capacitor—3600 Mmfd.—(C11).
11287	Capacitor—4500 Mmfd.—(C14).
4868	Capacitor—.005 Mfd.—(C29).
11395	Capacitor—.01 Mfd.—(C24).
4858	Capacitor—.01 Mfd.—(C25, C27).
11315	Capacitor—.015 Mfd.—(C33).
12670	Capacitor—.035 Mfd.—(C28).
4841	Capacitor—0.1 Mfd.—(C19).
11414	Capacitor—0.1 Mfd.—(C15).
5170	Capacitor—0.25 Mfd.—(C32).
11387	Capacitor—10 Mfd.—(C16).
11240	Capacitor—10 Mfd.—(C30).
5212	Capacitor—18 Mfd.—(C31).
11617	Coil—Antenna coil less shield—(L2, L3, L4, L5, C3, R1).
11618	Coil—Oscillator coil less shield—(L6, L7, L8, L9, L10, L11, C10).
13597	Condenser—2-gang variable tuning condenser—(C4, C5, C7, C8).
5119	Connector—3-contact female connector for speaker cable.
12006	Core—Adjustable core and stud for Stock No. 13106 and 13107.
12792	Dial—Station selector dial.
13598	Drive—Variable tuning condenser vernier drive.
13599	Foot—Chassis mounting foot and bracket.
12770	Holder—Dial scale holder and lamp bracket assembly less bracket for top dial lamp socket.
12712	Indicator—Station selector indicator pointer.
5226	Lamp—Dial lamp—6.3 volt.
12718	Mask—Dial light diffuser complete with red, orange and green-colored screen.
11466	Resistor—Voltage divider resistor—comprising one 3,500-ohm, one 13,000-ohm, one 85-ohm, one 40-ohm and one 175-ohm sections—(R14, R15, R16, R17, R18).
11624	Resistor—22 ohms—Flexible type complete with grid contact cap—(R19).
11620	Resistor—220 ohms—Carbon type—1/10 watt—(R1).
8070	Resistor—22,000 ohms—Carbon type—1/2 watt—(R4).
11400	Resistor—27,000 ohms—Carbon type—1/4 watt—(R10).
11282	Resistor—56,000 ohms—Carbon type—1/10 watt—(R5).
12286	Resistor—56,000 ohms—Insulated—1/4 watt—(R3).

Stock No.	DESCRIPTION
11398	Resistor—220,000 ohms—Carbon type—1/10 watt—(R7).
11453	Resistor—270,000 ohms—Carbon type—1/10 watt—(R12).
11452	Resistor—470,000 ohms—Carbon type—1/10 watt—(R13).
11397	Resistor—560,000 ohms—Carbon type—1/10 watt—(R2).
11626	Resistor—2.2 megohms—Carbon type—1/4 watt—(R6).
12008	Shield—I. F. transformer shield for Stock Nos. 13106 and 13107.
12607	Shield—First I. F. transformer shield top.
12581	Shield—Second I. F. transformer shield top.
11603	Shield—Coil shield for Stock Nos. 11617 and 11618.
12735	Shield—Dial lamp shield.
12771	Socket—Dial lamp socket—Located at top of dial scale.
11199	Socket—Dial lamp socket.
11195	Socket—5-contact 5Z4 Radiotron socket.
11198	Socket—7-contact 6F5, 6H6 Radiotron socket.
11196	Socket—8-contact 6A8, 6F6 or 6K7 Radiotron socket.
12007	Spring—Retaining spring for core Stock No. 12006.
12769	Switch—Range switch—(S2, S3).
12668	Tone Control—Control and power switch—(R9, S1).
13106	Transformer—First I. F. transformer—(L12, L13, C17, C18).
13107	Transformer—Second I. F. transformer—(L14, L15, C20, C21, C22, R5, R7).
11848	Transformer—Power transformer—105-125-volt, 50-60-cycle—(T1).
11849	Transformer—Power transformer—105-125-volt, 25-40-cycle—(T1).
11850	Transformer—Power transformer—105-250-volt, 40-60-cycle—(T1).
11391	Trap—Wave trap—(L1, C1).
13144	Volume control—(R11).
	REPRODUCER ASSEMBLIES
12641	Board—Reproducer terminal board.
12640	Bracket—Output transformer mounting bracket and clamp.
13600	Coil—Field coil—(L16).
11469	Coil—Neutralizing coil—(L18).
12667	Cone—Reproducer cone complete—(L17).
5118	Connector—3-contact male connector for speaker cable.
9766	Reproducer complete.
11253	Transformer—Output transformer—(T2).
11886	Washer—Spring washer to hold field coil securely.
	MISCELLANEOUS ASSEMBLIES
12666	Cover—Reproducer cover assembly.
12698	Crystal—Station selector crystal and escutcheon.
11582	Knob—Range switch knob.
12699	Knob—Large station selector knob.
12700	Knob—Small (vernier) station selector knob.
11347	Knob—Tone control or volume control knob.
11210	Screw—Chassis mounting screw assembly.
11349	Spring—Retaining spring for knob—Stock No. 11347, No. 11582 and No. 12700.
4982	Spring—Retaining spring for knob—Stock No. 12699.

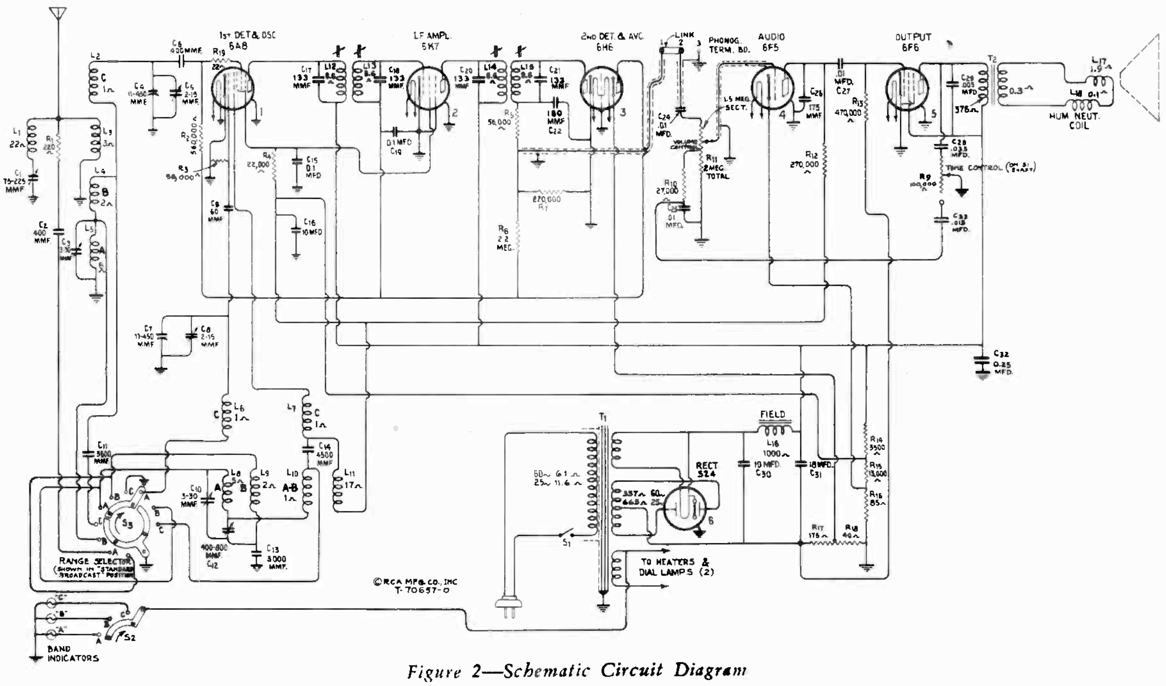


Figure 2—Schematic Circuit Diagram
(Model 6K2, Second Production)

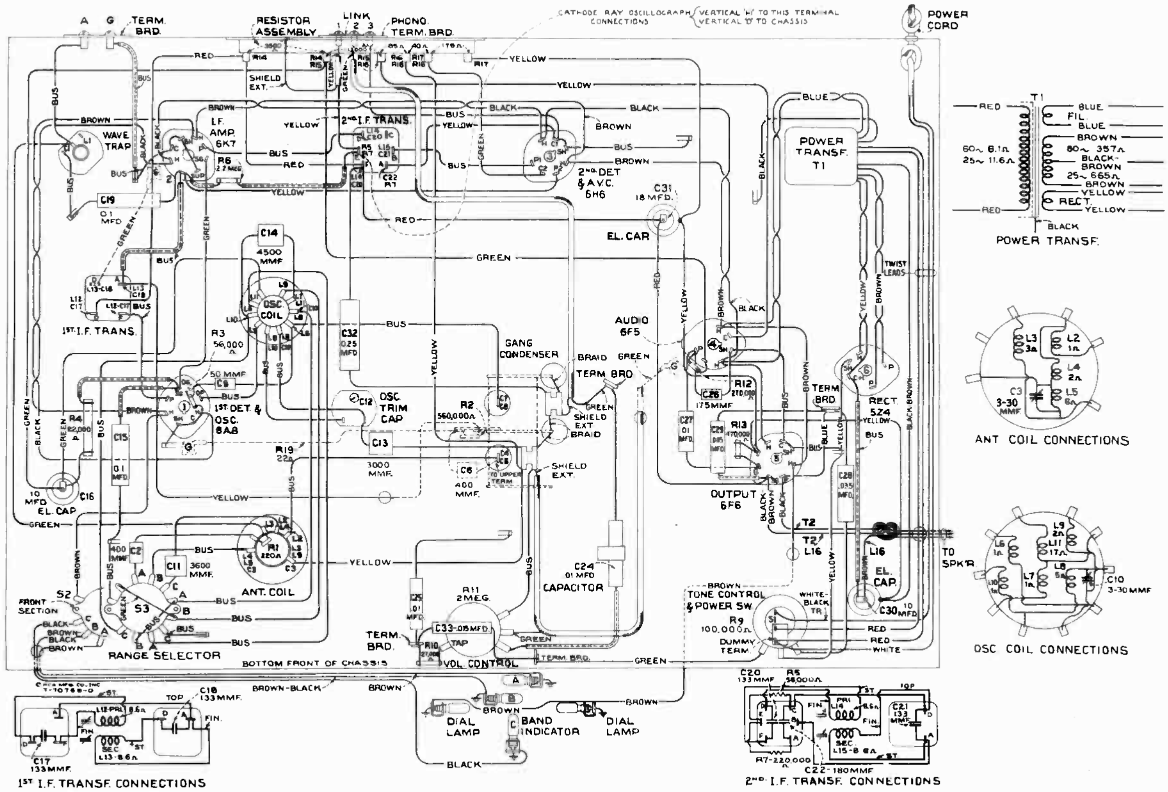


Figure 3—Chassis Wiring Diagram
(Model 6K2, Second Production)

SERVICE DIVISION
RCA Manufacturing Co., Inc.
Camden, N. J., U. S. A.

RCA VICTOR MODELS 6T10, 6K10, 8T10, AND 9K10

Technical Information and Service Data

(Issued as a supplement to Service Data

for Models 6T2, 6K2, 8T, and 9K2)

These instruments are similar to Models 6T2, 6K2, 8T, and 9K2 respectively except for cabinet design. The cabinets for these receivers have chromium trimmings which include tubular-steel support rails. Each Model is separately described below.

MODELS 6T10 and 6K10

The chassis and speakers for these instruments are identical to Models 6T2 and 6K2 (first production) respectively. All Service Data for Models 6T2 and 6K2 are directly applicable to these instruments except the Replacement Parts for Miscellaneous Assemblies which are listed below.

REPLACEMENT PARTS
6T10 - 6K10

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

STOCK NO.	DESCRIPTION
	MISCELLANEOUS ASSEMBLIES
13303	CRYSTAL - Station selector escutcheon and crystal
13304	KNOB - Large station selector knob Model 6T10 only
13395	KNOB - Large station selector knob Model 6K10 only
13305	KNOB - Small (vernier) station selector knob - Model 6T10 only
13396	KNOB - Small (vernier) station selector knob - Model 6K10 only
13306	KNOB - Tone control, volume control, or range-switch knob - Model 6T10 only
13278	KNOB - Tone control, volume control, or range-switch knob - Model 6K10 only
11210	SCREW - Chassis mounting screw assembly - Model 6K10 only
11377	SCREW - Chassis mounting screw assembly - Model 6T10 only
4982	SPRING - Retaining spring for knob Stock No. 13304 and 13395
11349	SPRING - Retaining spring for knob Stock No. 13278, 13305, 13306, and 13396

MODEL 8T10

The chassis and speaker for this instrument are identical to Model 8T. All Service Data for Model 8T are directly applicable to these instruments except the Replacement Parts for Miscellaneous Assemblies which are listed below.

REPLACEMENT PARTS

8T10

STOCK NO.	DESCRIPTION
	MISCELLANEOUS ASSEMBLIES
11996	BRACKET - Tuning tube mounting bracket and clamp
13303	CRYSTAL - Station selector escutcheon and crystal
13275	ESCUTCHEON - Tuning tube escutcheon
13315	KNOB - Large station selector knob
13316	KNOB - Small (vernier) station selector knob
13317	KNOB - Volume control, tone control, or range switch knob
11377	SCREW - Chassis mounting screw assembly
4982	SPRING - Retaining spring for knob Stock No. 13315
11349	SPRING - Retaining spring for knob Stock No. 13316, and 13317

MODEL 9K10

The chassis and speaker for this instrument are identical to Model 9K2. All Service Data for Model 9K2 are directly applicable to these instruments except the Replacement Parts for Miscellaneous Assemblies which are listed below.

REPLACEMENT PARTS
9K10

STOCK NO.	DESCRIPTION
	MISCELLANEOUS ASSEMBLIES
11996	BRACKET - Tuning tube bracket and clamp assembly
13274	CRYSTAL - Station selector escutcheon and crystal
13275	ESCUTCHEON - Tuning tube escutcheon
13278	KNOB - Low-frequency tone control and power switch, volume control, range switch or high-frequency tone control knob
13276	KNOB - Large station selector knob
13277	KNOB - Small (vernier) station selector knob
11210	SCREW - Chassis mounting screw assembly
12916	SHIELD - R.F. unit top shield
11349	SPRING - Retaining spring for knob Stock No. 13277 and 13278
4982	SPRING - Retaining spring for knob Stock No. 13276

SERVICE DIVISION
RCA MANUFACTURING CO., INC.,
CAMDEN, N. J., U.S.A.

RCA VICTOR MODELS 6M AND 6M2

Six-Tube, Superheterodyne Automobile Receivers

Technical Information

Electrical Specifications

RADIOTRON COMPLEMENT

(1) RCA-6D6 .... Radio-Frequency Amplifier
(2) RCA-6A8 .... First Detector–Oscillator
(3) RCA-6K7 .... Intermediate Amplifier
(4) RCA-85 ..... Second Detector, A-F, and A.V.C.
(5) RCA-6C5 .... Driver
(6) RCA-6A6 .... Power Output Amplifier

Tuning Range .... 540 to 1,600 kc.

OUTPUT RATING

Maximum .... 9.0 Watts
Undistorted .... 6.0 Watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (v. c.) .... 3 Ohms at 400 Cycles

POWER RATING

Supply Voltage .... 6.3 Volts (Storage Battery)
Current Drain .... 7.3 Amperes at 6.3 Volts
Fuse Protection .... 15 Amperes
Pilot Lamp .... Mazda No. 44, 6.3 Volts

ALIGNMENT FREQUENCIES

I. F. Transformers .... 260 kc.
Oscillator Coil .... 600 kc. and 1,400 kc.
Detector Coil .... 1,400 kc.
Antenna Coil .... 1,400 kc.

Mechanical Specifications

RECEIVER CASE DIMENSIONS	Model 6M	Model 6M2
Height	7 Inches	7 Inches
Width	10$\frac{1}{16}$ Inches	10$\frac{1}{16}$ Inches
Depth	7$\frac{1}{8}$ Inches	7$\frac{1}{8}$ Inches

LOUDSPEAKER CASE DIMENSIONS Model 6M2

Diameter .... 8$\frac{3}{4}$ Inches
Depth .... 5 Inches

OPERATING CONTROLS .... (1) Power Switch–Volume, (2) Tuning, (3) High-Frequency Tone

TUNING DRIVE RATIO 12-to-1

WEIGHT	Model 6M	Model 6M2
Receiver and Accessories Complete	24$\frac{1}{4}$ Pounds	29 Pounds
Complete Equipment Packed for Shipment	26$\frac{3}{4}$ Pounds	32$\frac{1}{2}$ Pounds

General Description

These two automobile receivers represent the results of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of installation, operation, and efficiency of performance.

Model 6M is a single-unit receiver containing the radio chassis, power conversion system, and loudspeaker all in one housing. A convenient three-contact loudspeaker receptacle installed on the chassis case permits the addition of a remote dynamic loudspeaker if desired.

Model 6M2 is a double-unit receiver utilizing a chassis and its power conversion equipment similar to the Model 6M, assembled together in one case, with its loudspeaker mounted individually in a separate cylindrical housing.

Engineering features incorporated in these instruments are: The inclusion of ignition suppression means within the circuits of the receiver; reduction of power line modulation in antenna circuit; improved high-gain molded core antenna coil; permeability tuned intermediate frequency transformers; continuously variable high-frequency tone control; and a "plug-in" type of synchronous rectifier-vibrator for obtaining high-voltage supply.

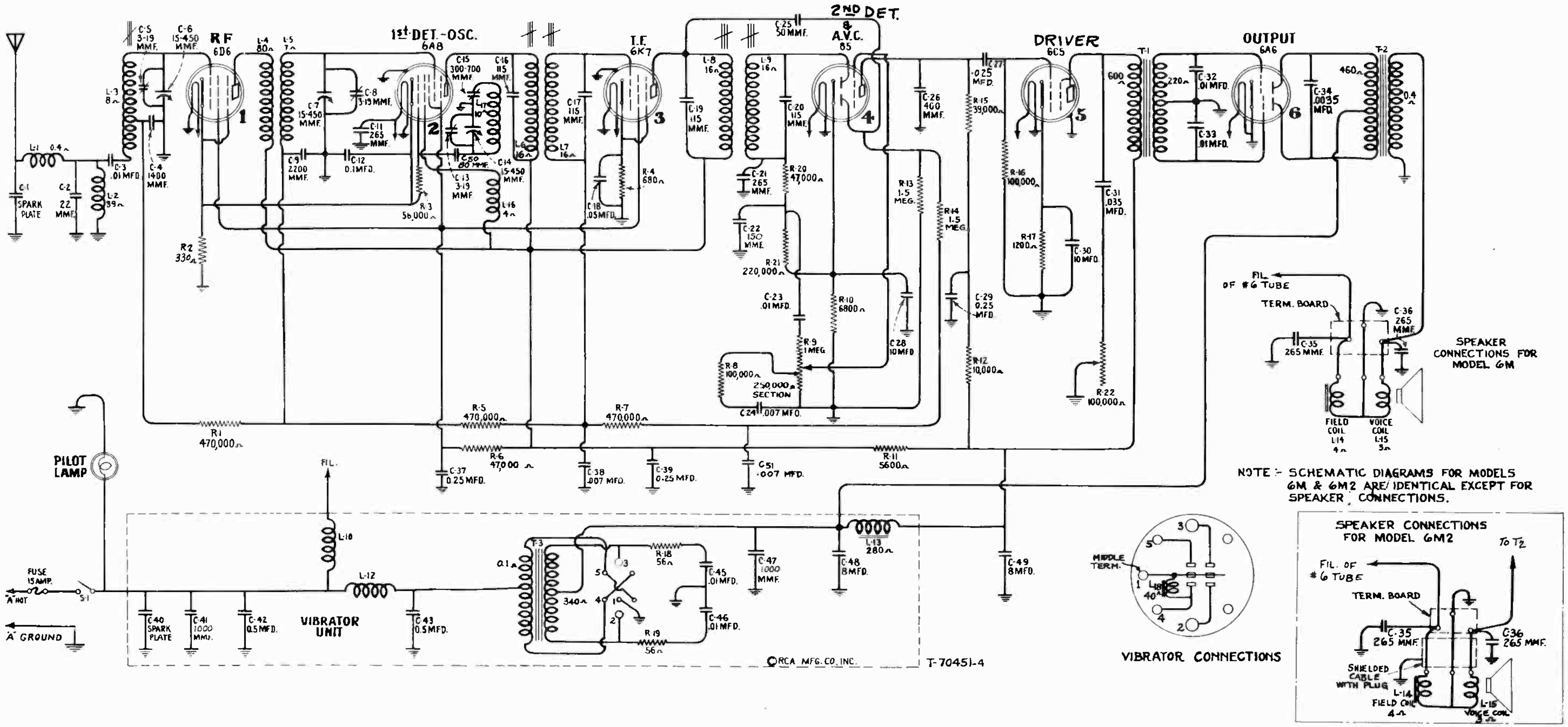


Figure 1—Schematic Circuit Diagram

Certain automobile installations require change of value of capacitor C-3. See note in text under "Service Data."

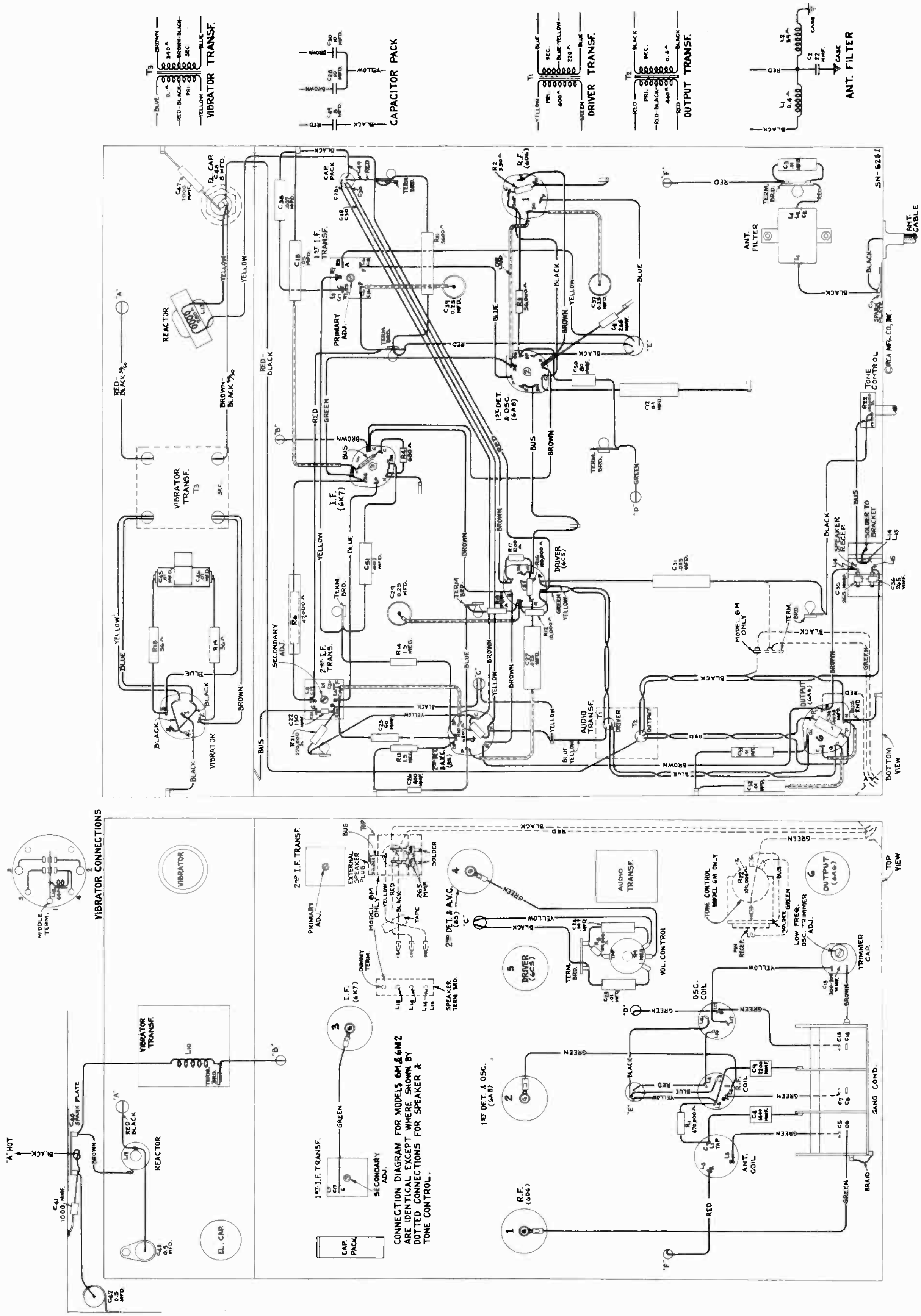


Figure 2—Chassis Wiring Diagram

Correct arrangement of parts, adequate shielding, and the ingenious insertion of filters at proper points in the circuit insure minimum disturbances from apparatus associated with the electrical circuits of the automobile and from outside sources.

Both receivers are compactly housed in substantial metal cases. Removable covers permit ready access to the under and top sides of the chassis. Flexible shafts interconnect the operating head to the controlled devices within the receiver housing. These units are adaptable for mounting on either the right-hand or the left-hand side of the engine firewall as local conditions demand.

Circuit Arrangement

The schematic and wiring layouts of the electrical circuit are shown in Figures 1 and 2 respectively. From these diagrams it may be seen that six Radiotrons are incorporated in the basic superheterodyne circuit. In sequence, there is an r-f stage, a dual first detector–oscillator stage, a single i-f stage, a second detector–audio amplifier–a.v.c. stage, a driver stage, and a class "B" output stage. The power supply system contains a mechanical interrupter and rectifier. The following circuit features are of particular importance:

Noise Filter—Reduction of ignition interference and similar disturbances are brought about by filter arrangements in the antenna input circuit and the "A" battery input lead. This antenna filter, L-1, C-1,

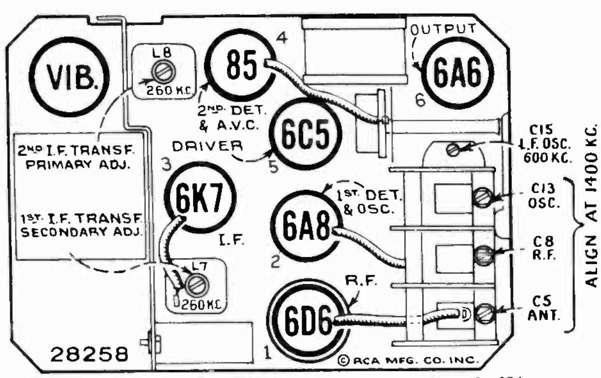


Figure 3—Radiotron, Coil, and Trimmer Locations

and C-2, is a "low-pass" type, having an acceptance band below 1,600 kc. The inductance L-2 is for the purpose of shunting out power line hum pickup.

Tuned Circuits—There are seven resonant circuits in the radio frequency end of the receiver. The r-f, first detector, and oscillator grid circuits are tuned by a three-gang tuning condenser. The remaining tuned circuits consist of the primary and secondary windings of the i-f transformers, which resonate with fixed condensers and are tuned by molded cores to a nominal frequency of 260 kilocycles.

Detection—Detection takes place as a result of the rectifying action of one of the diodes of the RCA-85 tube, the current being developed through resistors R-20 and R-21. The audio component of this current is coupled through capacitor C-23 to the one megohm volume control R-9. The arm of this volume control is connected to the grid of the RCA-85 tube, thus giving a means of continuously varying the voltage input to the audio amplifier.

A.V.C.—The a.v.c. diode of the RCA-85 tube is coupled through capacitor C-25 to the primary of the second i-f transformer. Due to the rectifying action of this diode, a current is developed through resistor R-13. The d-c voltage drop in this resistor is used for automatically regulating the control grid bias of the r-f, first detector, and i-f stages, the voltage being applied through a suitable filter network. Due to the fact that the a.v.c. diode returns through resistor R-13 to a point which is 15 volts negative with respect to its cathode, the a.v.c. action is delayed until the input signal reaches a predetermined level. This gives more uniform output for widely varying signal strengths into the antenna.

Audio System—As mentioned under "Detection", the audio component of the detected signal is selected from the manual volume control and applied to the control grid of the RCA-85 tube. The plate circuit of this tube is connected through capacitor C-27 to the control grid of the driver tube, an RCA-6C5. The plate circuit of the driver tube is coupled through the driver transformer T-1 to the control grids of the class "B" output tube, RCA-6A6. This tube is coupled through the output transformer T-2 to the loudspeaker.

SERVICE DATA

NOTE: *Certain models of* 1936 *automobiles are equipped with "high-capacitance type" (*400 *mmfd. or greater) built-in antennas. The* 1936 *models of Dodge, De Soto, and Chrysler are examples of automobiles so equipped. Installation of receiver in automobiles with such "high-capacity" antennas necessitates the following modification of the antenna circuit of the receiver to suit the characteristics of the antenna installation:*

Remove the tubular paper-covered capacitor C-3 *(*.01 *mfd.), Figure* 2, *and replace with the small molded type capacitor (*500 *mmfd.) furnished with Escutcheon Kit for respective model of automobile.*

Alignment Procedure

There are four alignment trimmers provided in the antenna coil, detector coil, and oscillator coil tuned circuits. The i-f transformer adjustments are made by means of four screws attached to molded cores.

NOTE: *The antenna coil has a molded core which is adjusted at the factory for the correct inductance.* ***This adjustment should not be disturbed.***

In readjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as the RCA Stock No. 9595, will be required as the source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to accurately shown when the correct point of adjustment is reached. Two indication methods are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave image which represents the resonance characteristics of the circuits being tuned. This type of alignment is possible through use of apparatus such as the RCA Stock No. 9558 Frequency Modulator and the RCA Stock No. 9545 Cathode-Ray Oscillograph. Alignment by the output meter method should be indicated by an instrument such as the RCA Stock No. 4317 Neon Glow Indicator. The two procedures are outlined as follows:

CATHODE-RAY ALIGNMENT

Attach the cathode-ray oscillograph vertical input terminals to the second detector output, with the "Hi" connected to the junction of the two resistors, R-20 and R-21, and the "0" connected to the receiver chassis. Advance the vertical amplifier gain control of the oscillograph to full-on, allowing it to remain at such position for all adjustments. Turn the vertical "A" amplifier to "On." Set the oscillograph power switch to "On" and adjust the intensity and focusing controls to give a sharply defined spot on the screen. Interconnect the frequency modulator impulse generator terminals to the oscillograph "Ext. Sync." terminals, as shown by Figure 4.

I-F Adjustments

(a) Connect the output of the test oscillator to the control grid cap of the i-f tube (RCA-6K7) through a 0.25 mfd. capacitor and connect the ground of the oscillator to the receiver chassis. Tune the oscillator to 260 kc., place its modulation switch to "On" and its output range switch to "Hi." The frequency modulator must not be connected to the oscillator for the preliminary adjustments.

(b) Set the cathode-ray oscillograph horizontal "B" amplifier to "Timing" and the synchronizing switch (timing) to "Int." Place the synchronizing input and frequency controls to about their mid-positions. Turn the range switch to its No. 1 position.

(c) Increase the output of the oscillator until a deflection is noticeable on the oscillograph screen. The figure obtained represents several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave image formed (400-cycle waves) to be spread completely across the screen by advancing the horizontal "B" gain control. The image should be synchronized and made to remain motionless by adjustment of the synchronizing input and frequency controls.

(d) Adjust the two screws (attached to molded cores) of the second i-f transformer, one on top and one on bottom, to produce maximum vertical deflection of the oscillographic wave which is present on the screen. This adjustment places the transformer in exact resonance with the 260 kc. signal.

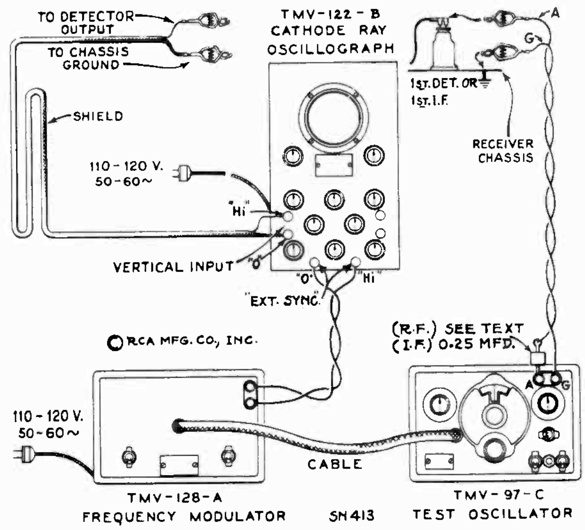


Figure 4—Alignment Apparatus Connections

(e) The sweeping operation should follow using the frequency modulator. Shift the oscillograph synchronizing switch to "Ext.", change its range switch to No. 2 position and set the frequency control to its mid-position. Place the frequency modulator in operation, with its sweep range switch in the "Lo" position. Interconnect the test oscillator and frequency modulator with the special shielded patch cord provided. Turn the oscillator modulation switch to "Off."

(f) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. These waves will be identical in shape, but will be totally disconnected and appearing in reversed positions. They will have a common base line, which is discontinuous. Adjust the frequency and synchronizing input controls of the oscillograph to get the proper waves and to make them remain motionless on the screen. Continue increasing the oscillator frequency until the forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will obtain at an oscillator setting of approximately 360 kc.

(g) With the images established as in (f), readjust the two screws on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(h) Without altering the adjustments of the apparatus, shift the output connections of the oscillator to the input of the i-f system, i. e., between the first detector (RCA-6A8) control grid and ground. Regulate its output so that the amplitude of the oscillographic image is approximately the same as used above for adjustment (g) of the second i-f transformer.

(i) The two first i-f transformer adjustment screws, one on top and one on bottom, should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

NOTE: Before making r-f adjustments, it may be advisable to replace the bottom cover to eliminate vibrator interference.

(a) Adjust the dial pointer on the remote control head by the following procedure. Rotate tuning knob to its extreme clockwise position irrespective of location of pointer on dial. Now turn the pointer adjusting screw in the center of the back of the control unit until the pointer is at the end calibration mark below the 55 on dial scale.

(b) Attach the output of the test oscillator to the receiver input, i. e., between the antenna and ground terminals, with a 175 mmfd. capacitor in series with antenna lead.

NOTE: For r-f alignment of receivers in which the tubular paper condenser **C-3** *(*.**01** *mfd.) has been replaced by the small molded condenser* **500** *mmfd. (change easily identified by reference to Figure* **2** *and bottom of chassis), use a* .**001** *mfd. capacitor instead of the* **175** *mmfd. capacitor in series with the antenna lead and test oscillator.*

There should be a shunt capacitor of 50 or 60 mmfd. from the antenna lead at the receiver to ground. Accurately tune the oscillator to 1,400 kc. The oscillograph should be left connected to the second detector output circuit as for the above i-f adjustments. Return the synchronizing switch to its "Int." position and turn the range switch to its No. 1 position.

(c) Tune the receiver to a dial reading of 1,400 kc. Then regulate the oscillator output so as to increase the amplitude of the waves on the oscillograph screen to a conveniently observable size. The several waves of detected signal, as appearing on the screen, should be synchronized by operation of the synchronizing and frequency controls. Trimmers, C-13, C-8, and C-5, of the oscillator, detector, and antenna coils should then be adjusted so that each causes maximum vertical deflection (amplitude) of the images.

(d) The oscillator modulation should then be turned to "Off" and the frequency modulator placed in operation, connected to the oscillator with the shielded patch cord. Change the oscillograph synchronizing switch to "Ext.", set its range switch to its No. 2 position and the frequency control slightly above its mid-position.

(e) Increase the frequency of the test oscillator gradually, until the point is reached where the two similar, distinct, and separate wave images appear on the screen and become coincident at their highest points. This will occur at an oscillator setting of approximately 1,500 kc. These waves should be synchronized on the oscillograph screen by careful readjustment of the synchronizing and frequency controls. Readjust trimmers, C-13, C-8, and C-5, to produce complete coincidence at maximum amplitude of the two waves.

(f) Disconnect the frequency modulator from the oscillator. Place the modulation switch of the oscillator to "On" and tune the oscillator to 600 kc. Set the synchronizing switch of the oscillograph to "Int." and turn the range switch to No. 1 position.

(g) Tune the receiver station selector control so as to pick up the 600 kc. signal, disregarding the dial reading at which it is best received.

(h) Change the oscillograph synchronizing switch to "Ext." and place the oscillator modulation switch to "Off." Interconnect the frequency modulator and oscillator with the special shielded patch cord. Return the range control of the oscillograph to its No. 2 position and set the frequency control slightly above its mid-position.

(i) Shift the test oscillator to its 200-400 kc. range and tune it to the point at which the forward and reverse waves show on the oscillograph screen. This condition will obtain at an oscillator setting of approximately 230 kc. The signal obtained from the oscillator for this adjustment will be the third harmonic of 200 kc. An increase in the oscillator output may be necessary. The trimmer C-15 should then be adjusted to the point which produces maximum amplitude of the oscillographic images. It will not be necessary to rock the tuning control for this adjustment, inasmuch as the frequency modulator is varying the signal in an equivalent manner.

(j) Retune trimmers C-13, C-8, and C-5 as in (c), (d), and (e) to correct for any change in high-frequency alignment which may have been caused by the adjustment of C-15.

OUTPUT METER ALIGNMENT

Place the receiver in operation with its two covers removed. Attach the output indicator across the loudspeaker voice coil circuit or across the output transformer primary. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test oscillator output control so that the signal level is as low as possible and still observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

(a) Connect the output of the test oscillator to the control grid cap of the i-f tube (RCA-6K7) through a 0.25 mfd. capacitor and connect the ground of the oscillator to the receiver chassis. Adjust the frequency of the oscillator to 260 kc. Tune the receiver to a point where no interference is received from the heterodyne oscillator or local stations.

(b) Adjust the two screws (attached to molded cores) of the second i-f transformer, one on top and one on bottom, until maximum output is produced by the indicating device.

(c) Remove the oscillator from the i-f tube input and connect it between the control grid cap of the first detector tube (RCA-6A8) and chassis-ground, using the 0.25 mfd. capacitor as previously. Allow its tuning to remain at 260 kc. Tune the receiver to avoid interference as in (a).

(d) Adjust the two screws of the first i-f transformer for maximum (peak) receiver output. The indication for this adjustment will be broad due to the "flat-top" characteristic of the i-f system. The two screws should, therefore, be very carefully adjusted so that the indicator remains fixed at maximum as the oscillator is shifted through a range 2 kc. above and below its normal setting of 260 kc. An irregular double-peaked indication is to be avoided.

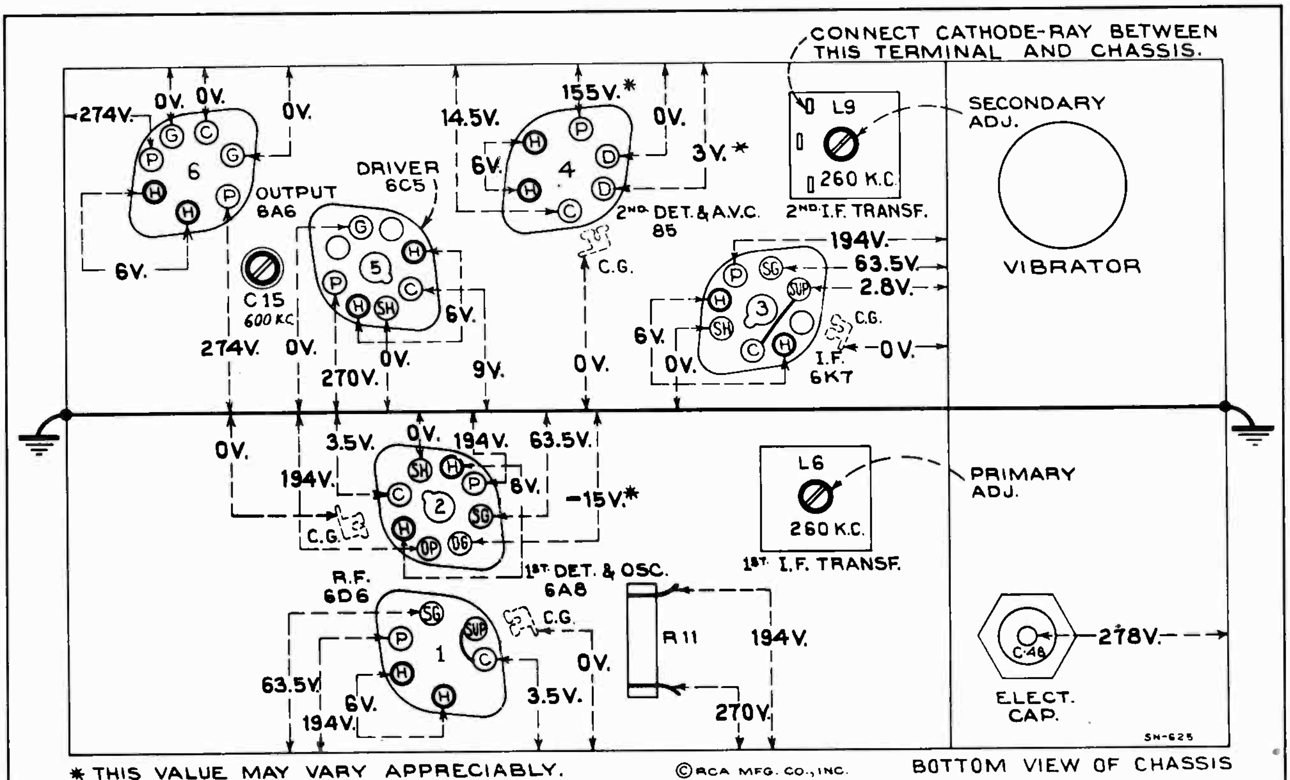


Figure 5—Radiotron Socket Voltages and Trimmer Locations

(Measured at 6.3 volts battery supply—Volume Control Maximum—No Signal)

Radiotron Socket Voltages

Operating conditions of the basic circuits of this instrument may be determined by measuring the voltages applied to the tube elements. Figure 5 shows the voltage values from the socket contacts to ground and appearing across the heater contacts (H-H). Each value as specified should hold within ±20% when this instrument is normally operative with all tubes intact and rated voltage applied. Variations in excess of this limit will usually be indicative of trouble.

The voltages given on this diagram are actual measured voltages, and are obtained with the voltmeter load in the circuit.

To fulfill the conditions under which the d-c voltages were measured requires a 1,000-ohm-per-volt d-c voltmeter having ranges of 10, 50, 250, and 500 volts. Voltages below 10 volts should be measured on the 10-volt scale; between 10 and 50 on the 50-volt scale; between 50 and 250 on the 250-volt scale; and above 250 on the 500-volt scale.

R-F Adjustments

NOTE: Before making r-f adjustments, it may be advisable to replace the bottom cover to eliminate vibrator interference.

(a) Adjust the dial pointer on the remote control head by the following procedure. Rotate tuning knob to its extreme clockwise position irrespective of location of pointer on dial. Now turn the pointer adjusting screw in the center of the back of the control unit until the pointer is at the end calibration mark below the 55 on dial scale.

(b) Connect the output of the test oscillator to the antenna-ground terminals of the receiver with a 175 mmfd. capacitor in series with the antenna lead.

NOTE: For r-f alignment of receivers in which the tubular paper condenser C-3 (.01 *mfd.) has been replaced by the small molded condenser* 500 *mmfd. (change easily identified by reference to Figure* 2 *and bottom of chassis), use a* .001 *mfd. capacitor instead of the* 175 *mmfd. capacitor in series with the antenna lead and test oscillator.*

There should be a shunt capacitor of 50 or 60 mmfd. from the antenna lead at the receiver to ground. Tune the oscillator to 1,400 kc. Allow the output indicator to remain attached to the receiver output.

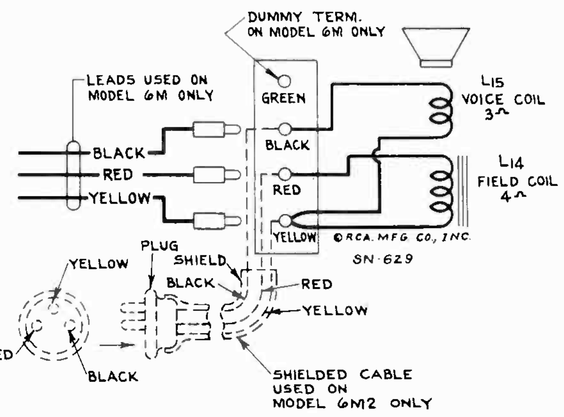


Figure 6—Loudspeaker Schematic and Wiring

(c) Tune the receiver so that the dial reading is 1,400 kc. Then adjust the oscillator, detector, and antenna coil trimmers, C-13, C-8, and C-5 respectively, tuning each to the point producing maximum indicated receiver output.

(d) Shift the oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. The oscillator series trimmer, C-15, should then be adjusted, simultaneously rocking the receiver tuning control backward and forward through the signal until maximum (peak) receiver output results from the combined operations. The adjustment of C-13, C-8 and C-5 should be repeated as in (c) to correct for any change in its alignment due to the adjustment of C-15.

Final Tuning Dial Adjustment

Final adjustment of the dial pointer may be made during operation after the receiver is installed in automobile. To do this, tune in a station of known frequency (say 760 kc.—approximately 76 on dial) as accurately as possible. Now reset the dial pointer to exactly 76 on the dial by means of the adjusting screw at center rear of operating head.

Volume Control and Power Switch

This adjustment is made by turning the small control knob fully clockwise and then fully counterclockwise. This places the friction clutch mechanism on the volume control in proper alignment.

Tuning Condenser Drive

Smooth control should be obtained over the entire tuning range of the variable condenser. If irregularity is present, check the action of the gear mechanism for binding or backlash at every point within the tuning range. A bind may be due to improper mesh between the worm gear and the large gears on the condenser shaft. To correct such a condition, loosen the three screws holding the gear plate and adjust the mesh of the gears to a position which gives smooth operation. Gear backlash is prevented by the small compression spring between the two large gears on the rotor shaft.

Interrupter

The mechanical interrupter used in the power system is constructed with a plug-in base, so as to be easily removed from the receiver. Its adjustments have been correctly set during manufacture by means of special equipment. In cases of faulty operation of the interrupter, a renewal should be made.

The symmetrical plug-in base on this device permits the unit to be placed in its socket so as to give correct output voltage polarity on an automobile with either a positive or negative "A" ground. For installation with positive "A" ground, insert vibrator so positive (+) symbol is nearest label on vibrator compartment partition; for negative "A" ground, insert with negative (–) symbol nearest label.

Radiotrons

Deterioration of tubes and their approach to failure is usually evidenced by noisy or intermittent operation, loss of sensitivity, and distorted tone quality. When suspected as faulty, the tubes should be removed from the receiver and checked with standard tube testing apparatus. It is not feasible to test the tubes while in the receiver, due to measurement inaccuracies which would result from the effects of the circuits.

Receiver Housing

The screws holding the receiver chassis to the case must all be in place and tightly installed, inasmuch as they appreciably affect the ground resistance of the assembly and will consequently have a bearing on the amount of ignition noise received.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12511	Cap—Grid contact cap—Package of 5	$0.15
11130	Capacitor—Adjustable capacitor—(C15)	.40
11289	Capacitor—50 Mmfd.—(C25)	.26
12270	Capacitor—80 Mmfd.—(C50)	.28
11998	Capacitor—115 Mmfd.—(C16, C17, C19, C20)	.28
12725	Capacitor—150 Mmfd.—(C22)	.28
11181	Capacitor—265 Mmfd.—(C11, C35, C36)	.20
12761	Capacitor—265 Mmfd.—(C21)	.15
11171	Capacitor—400 Mmfd.—(C26)	.22
12762	Capacitor—1,000 Mmfd.—(C41, C47)	.20
12268	Capacitor—1,400 Mmfd.—(C4)	.34
12269	Capacitor—2,200 Mmfd.—(C9)	.42
5005	Capacitor—.0035 Mfd.—(C34)	.16
5148	Capacitor—.007 Mfd.—(C24, C38, C51)	.20
4858	Capacitor—.01 Mfd.—(C3, C23, C32, C33)	.25
4870	Capacitor—.025 Mfd.—(C27)	.20
5196	Capacitor—.035 Mfd.—(C31)	.18
4836	Capacitor—.05 Mfd.—(C18)	.30
4841	Capacitor—0.1 Mfd.—(C12)	.22
12237	Capacitor—.25 Mfd.—(C29, C37, C39)	1.02
5019	Capacitor—0.5 Mfd.—(C43)	.42
12234	Capacitor—8 Mfd.—(C48)	1.34
12233	Capacitor Pack—Comprising 2 sections each .01 Mfd.—(C45, C46)	1.02
12238	Capacitor Pack—Comprising one 8 Mfd. and two 10 Mfd. sections—(C28, C30, C49)	2.30
12223	Coil—Antenna coil—(L3)	.94
12235	Coil—Choke coil—(L12)	.50
12225	Coil—Oscillator coil—(L16. L17)	.80
12224	Coil—R. F. coil—(L4, L5)	1.32
12220	Condenser—3-gang variable tuning condenser—(C5, C 6,C7, C8, C13, C14)	4.50
12006	Core—Adjustable core for I. F. transformer Stock No. 12228 and No. 12229	.22
12289	Coupling—Station selector flexible shaft coupling	.20
12239	Filter—Antenna filter—(L1. L2. C2)	1.28
12221	Gear—Variable tuning condenser shaft drive gear (without tapped shaft)	.36
12222	Gear—Variable tuning condenser worm gear (use with No. 12221 only)	.36
12242	Guide—Station selector shaft guide	.18
12483	Pin—Contact pin for speaker leads (used in 6M only)—Package of 5	.15
12485	Pin—Contact pin for tone control lead (used in 6M only)—Package of 5	.15
12232	Reactor—Filter reactor—iron core—(L13)	1.10
5034	Resistor—56 ohm—carbon type, ½ watt—(R18, R19)—Package of 5	1.00
12481	Resistor—330 ohm—insulated, ¼ watt—(R2)—Package of 5	1.00
12262	Resistor—680 ohm—insulated, ¼ watt—(R4)—Package of 5	1.00
12267	Resistor—1,200 ohm—insulated, ¼ watt—(R17)—Package of 5	1.00
8097	Resistor—5,600 ohm—carbon type, 2 watt—(R11)	.25
12265	Resistor—6,800 ohm—insulated, ¼ watt—(R10)—Package of 5	1.00
12288	Resistor—10.000 ohm—insulated, ¼ watt—(R12)—Package of 5	1.00
12266	Resistor—39,000 ohm—insulated, ¼ watt—(R15)—Package of 5	$1.00
5132	Resistor—47,000 ohm—carbon type, 1/10 watt—(R20)—Package of 5	.75
12073	Resistor—47,000 ohm—carbon type, 1 watt—(R6)—Package of 5	1.10
12286	Resistor—56,000 ohm—insulated, ¼ watt—(R3)—Package of 5	1.00
12263	Resistor—100,000 ohm—insulated, ¼ watt—(R16)—Package of 5	1.00
11281	Resistor—100,000 ohm—carbon type, 1/10 watt—(R8)—Package of 5	.75
12264	Resistor—220,000 ohm—insulated, ¼ watt—(R21)—Package of 5	1.00
11452	Resistor—470,000 ohm—carbon type, 1/10 watt—(R5, R7)—Package of 5	.75
12285	Resistor—470,000 ohm—insulated, ¼ watt—(R1)—Package of 5	1.00
12287	Resistor—1.5 megohm—insulated, ¼ watt—(R13, R14)—Package of 5	1.00
3584	Ring—Retaining ring for R. F. or oscillator coil—Package of 5	.40
5129	Ring—Radiotron shield ring—Package of 5	.10
3623	Shield—R. F. or oscillator coil shield	.30
12290	Shield—Radiotron shield	.18
4786	Socket—6-contact 6D6 or 85 Radiotron socket	.15
12243	Socket—7-contact 6A6 Radiotron socket	.18
12227	Socket—8-contact 6A8, 6C5 or 6K7 Radiotron socket	.18
12241	Socket—Vibrator socket	.18
12226	Stud—Variable tuning condenser mounting stud assembly—Package of 4	.22
12228	Transformer—First I. F.—(L6, L7, C16, C17, R5, R7)	2.24
12230	Transformer—Output transformer—(T1, T2)	2.95
12229	Transformer—Second I. F. transformer—(L8, L9, C19, C20, C21, R20)	2.02
12231	Transformer—Vibrator power transformer—(T3)	3.42
12236	Vibrator complete	4.55
12240	Volume Control—(R9)	1.14
	CONTROL BOX AND FLEXIBLE SHAFT ASSEMBLIES	
12505	Box—Control box complete—less flexible shafts	6.35
12578	Dial—Station selector indicator dial (standard)	.50
12579	Knob—Station selector (tuning) knob (standard)	.28
12580	Knob—Volume control knob (standard)	.28
11891	Lamp—Control box dial lamp—Package of 5	.65
12504	Shaft—Tuning control flexible shaft complete—approx. 21½ in. long	1.20
12503	Shaft—Volume control flexible shaft complete—approx. 21½ in. long	1.20
	REPRODUCER ASSEMBLIES, MODEL 6M	
12482	Board—Reproducer terminal board	.30
12450	Coil—Field coil—(L14)	1.60
12451	Cone—Reproducer cone complete—(L15)	1.60
9687	Reproducer—Reproducer complete	5.65

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
	REPRODUCER ASSEMBLIES, MODEL 6M2	
12526	Board—2-contact reproducer terminal board	$0.20
12525	Cable—Shielded reproducer cable complete with 3-contact male connector	1.08
12524	Coil—Field coil—(L14)	1.85
12523	Cone—Reproducer cone—(L15)	1.65
12527	Housing—Reproducer housing complete	2.65
9691	Reproducer—Reproducer complete	11.38
12528	Screw—Reproducer housing screw—Package of 5	.14
	MISCELLANEOUS ASSEMBLIES	
4287	Body—Antenna cable female connector body—Package of 10	.40
4289	Body—"A" lead fuse connector body—Package of 10	.35
12510	Button—Plug button for receiver housing (used on 6M only)	.16
12444	Cable—Shielded antenna cable approx. 8 in. long, complete with female-section of connector	.58
12473	Cable—Shielded antenna lead-in cable, approx. 31 in. long, complete with 2 male connections of connector	1.12
4288	Cap—Male connector cap for "A" lead or antenna cable—Package of 10	.36
5025	Capacitor—Generator capacitor	.40
4293	Capacitor—Ammeter capacitor	.60
11418	Capacitor—.5 Mfd.—(C42)	.50
4291	Clip—"A" lead ammeter clip—Package of 10	.70
12457	Cover—Receiver housing top cover (used on 6M only)	.65
12458	Cover—Receiver housing bottom cover assembly (used on 6M only)	.60
12461	Cover—Receiver case bottom cover (used in 6M2 only)	.60
12462	Cover—Receiver case top cover (used in 6M2 only)	.62
12532	Fastener—Receiver housing top cover fastener—Package of 10	.30
4286	Ferrule—Antenna cabl eor "A" lead connector ferrule and bushing—Package of 10	.38
5023	Fuse—"A" lead fuse—15 amp.—Package of 5	.40
12623	Grille—Speaker grille assembly (used on 6M only)	$0.88
12456	Housing—Receiver housing complete (used on 6M only)	4.60
12460	Housing—Receiver case complete (used on 6M2 only)	4.58
4290	Insulator—Fuse connector insulator—Package of 10	.35
4323	Knob—Tone control knob (used on 6M only)—Package of 5	.70
4132	Knob—Tone control knob (used on 6M2 only)—Package of 5	.55
12445	Lead—"A" lead (set end), approx. 8 in. long, complete with male section of connector	.26
12506	Plate—Name plate and mounting screws (used in 6M only)	.28
12507	Plate—Name plate and mounting screws (used in 6M2 only)	.28
12508	Plate—RCA monogram and rivets (used on 6M2 only)	.28
12609	Ring—Rubber ring for speaker mounting (used on 6M2 only)	.28
12459	Screw—Speaker mounting screw assembly, consisting of 1 screw, 1 nut, and 1 lockwasher to mount speaker in case (used on 6M only)—Package of 4	.20
12533	Screw—Self-tapping slotted hex. head, ¼ in. long, used in receiver housing—Package of 10	.16
4393	Screw—Set screw for tone control knob Stock No. 4132 (used on 6M2 only)—Package of 10	.25
12248	Socket—3-contact socket and bracket assembly for reproducer cable	.20
12502	Socket—Pin socket and bracket assembly for tone control lead	.30
4284	Spring—Antenna cable connector spring—Package of 10	.30
12448	Stud—Receiver mounting stud assembly, comprising 1 stud, 1 washer, 1 lockwasher and 1 nut	.20
12254	Stud—Speaker mounting stud assembly, comprising 1 stud, 1 spacer, 1 washer and 2 nuts (used in 6M2 only)	.24
5024	Suppressor—Distributor suppressor	.38
12249	Tone Control—(R22)	.88
4285	Washer—Antenna cable connector insulating washer—Package of 10	.22

The prices quoted above are subject to change without notice.

First Edition.

RCA VICTOR MODELS 7T, 7K, 8T, and 8K

Seven-Tube and Eight-Tube, Three-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard Broadcast" .... 530- 1,800 kc
"Medium Wave" .... 1,800- 6,300 kc
"Short Wave" .... 6,300-22,000 kc

ALIGNMENT FREQUENCIES
"Standard Broadcast" .... 600 kc (osc.), 1,500 kc (osc., ant.)
"Medium Wave" .... 6,000 kc (osc., ant.)
"Short Wave" .... 20,000 kc (osc., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-6L7 .... First Detector
(2) RCA-6J7 .... Oscillator
(3) RCA-6K7 .... Intermediate Amplifier
(4) RCA-6H6 .... Second Detector and A.V.C.
(5) RCA-6F5 .... Audio Voltage Amplifier
(6) RCA-6F6 .... Power Output
(7) RCA-5Z4 .... Full-Wave Rectifier
(8) RCA-6E5 (Models 8T and 8K only) .Tuning Tube

Pilot Lamps (3) .... Mazda No. 46, 6.3 volts, 0.25 amperes

POWER-SUPPLY RATINGS
Rating A .... 105-125 volts, 50-60 cycles, 80 watts
Rating B .... 105-125 volts, 25-60 cycles, 80 watts
Rating C .... 100-130/140-160/195-250 volts, 40-60 cycles, 80 watts

POWER OUTPUT
Undistorted .... 2 watts
Maximum .... 4.5 watts

LOUDSPEAKER
Type .... Electrodynamic
Impedance (V.C.) .... 2.2 ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS	7T	7K	8T	8K
Height	20¼ inches	39 inches	21⅞ inches	40 inches
Width	14⅞ inches	24⅜ inches	15⁵⁄₁₆ inches	25½ inches
Depth	8⅜ inches	12 inches	8¾ inches	12¹⁄₁₆ inches
WEIGHTS				
Net	24 pounds	50 pounds	26 pounds	51 pounds
Shipping	29 pounds	65 pounds	33 pounds	67 pounds

Chassis Base Dimensions .... 12 inches x 7 inches x 2½ inches
Over-all Height of Chassis .... 8⅜ inches
Operating Controls .... (1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch–Tone
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Description

These receivers represent the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation and efficiency of performance.

Model 7T is a seven-tube, table-type, superheterodyne receiver with an eight-inch electrodynamic loudspeaker. Model 7K differs from the Model 7T in that it is of the console type and has a twelve-inch electrodynamic loudspeaker.

Models 8T and 8K are similar to Models 7T and 7K respectively, except for the addition of a tuning tube "Magic Eye" and different cabinet designs.

Design features incorporated in these receivers include: built-in doublet antenna coupler; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna and oscillator coil circuits; high-efficiency first detector (converter) with separate oscillator; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; aural compensated volume control; continuously variable tone control with music-voice switch; automatic volume control; phonograph terminal board; band selective indication of dial scales; and a dust-proof electrodynamic loudspeaker.

The tuning range is continuous through the "Standard broadcast," "Medium wave," and "Short wave" bands. This extensive range includes the important short-wave broadcast bands at 49, 31, 19, 16, and 13 meters in addition to channels assigned for

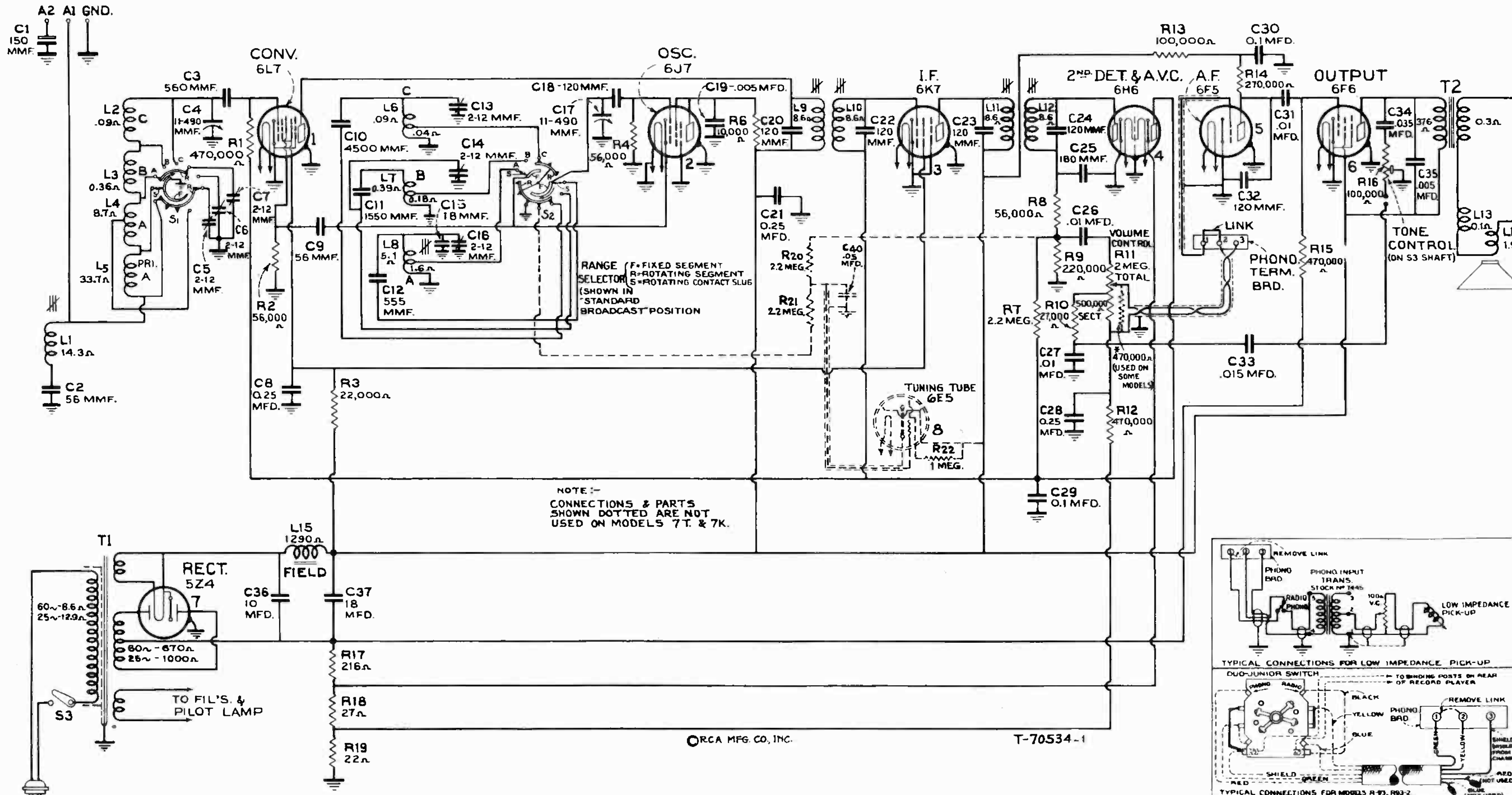


Figure 1—Schematic Circuit Diagram

(* 470,000-ohm resistor not required when replacing volume control with Stk. No. 13144)

SERVICE HINT.

Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

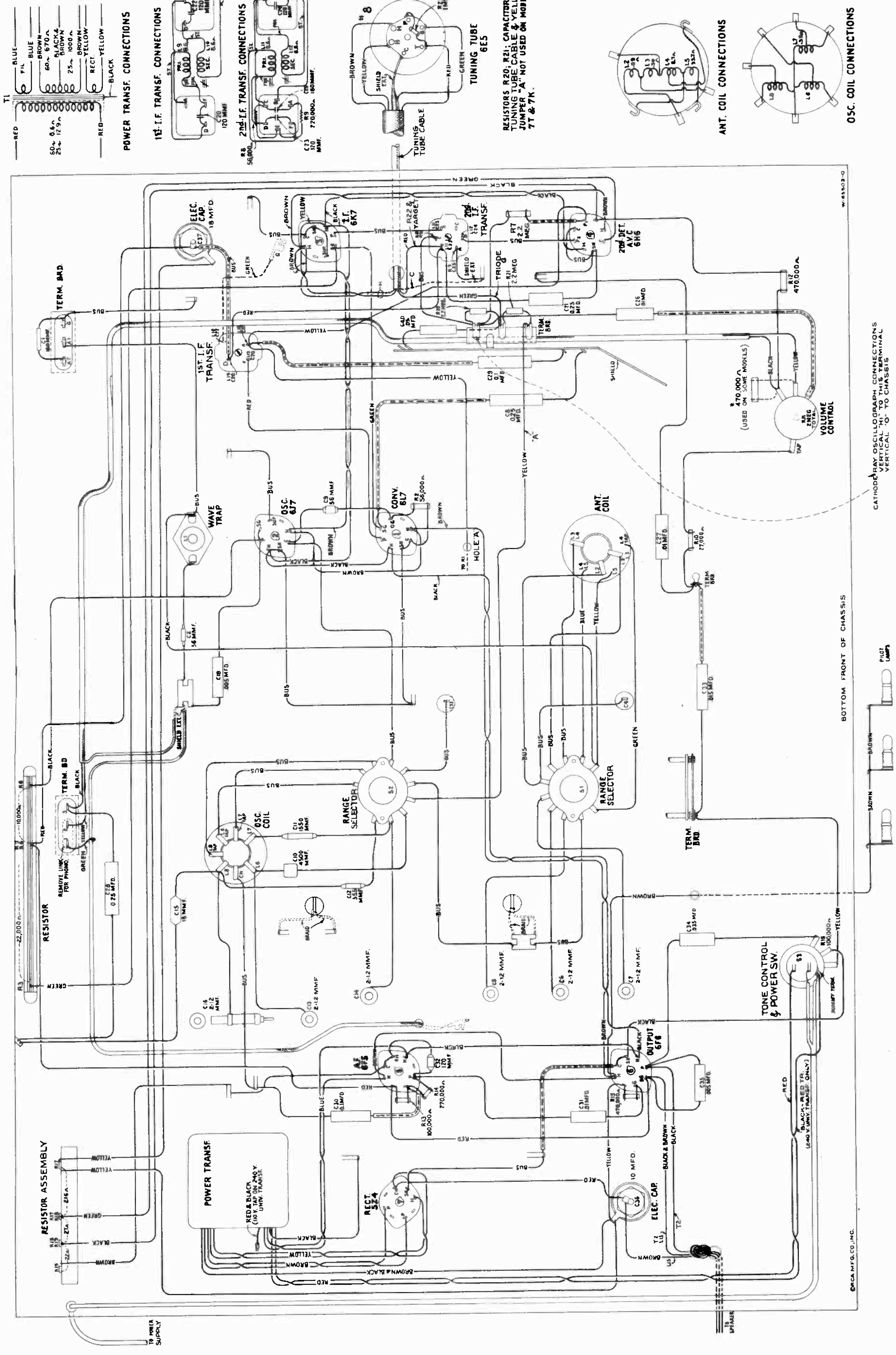


Figure 2—Chassis Wiring Diagram

police, amateur, and aviation communication. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. A double tuning knob arrangement permits the choice of either a ten-to-one or a fifty-to-one dial ratio, the latter permits ease of tuning, especially in the "Medium wave" and "Short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of a first-detector (converter) stage, separate oscillator stage, a single i-f stage, a diode-detector — automatic-volume-control stage, an audio voltage-amplifier stage, a pentode power-output stage, and a full-wave rectifier stage. Models 8T and 8K also have a tuning indicator "Magic Eye."

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to control grid No. 1 of the RCA-6L7 through a tuned r-f transformer. This transformer is tapped so that the range selector increases the range of tuning by decreasing the amount of inductance. A unique method of switching causes L5 to become the primary with L4, L3, and L2 as secondary, L4 to become the primary with L3 and L2 as secondary, and L3 to become the primary with L2 as secondary, for range selector positions "Standard broadcast," "Medium wave," and "Short wave" respectively. Separate windings are employed

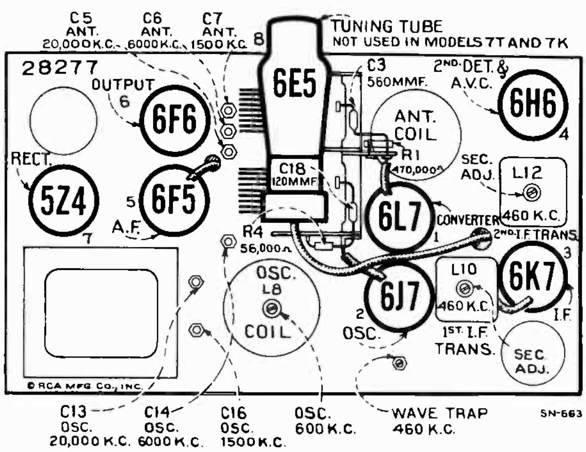


Figure 3—Radiotron, Coil, and Trimmer Locations

in the oscillator stage for each position of the range selector. All unused portions of the antenna and oscillator coils are shorted out to prevent undesirable interaction. Air-dielectric trimming capacitors are used for obtaining exact alignment. Proper low-frequency tracking of the oscillator for "Standard broadcast" is accomplished by adjusting the inductance of the respective coil with a molded magnetite core.

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to **460 kc.**

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R9, is applied as automatic control-grid bias to the first-detector and i-f tubes. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R7 and R9, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c.-diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio voltage-amplifier tube. This control has a tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are inserted at this point for feeding the output of an external phonograph pickup to the control grid of the audio amplifier. Resistance-capacity coupling is used between the first-audio stage and the power-output stage. The power-output stage is transformer-coupled to the electrodynamic loudspeaker. Continuously-variable tone control is effected by means of capacitor C34 and variable resistor R16 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R16 from the circuit and places an additional capacitor C33 in shunt with capacitor C27, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

Tuning Indicator (Models 8T and 8K only)

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. Maximum sensitivity of the tuning indicator is acquired in the "Short wave" position of the range selector S2 by removing the ground connection from resistor R21. In this position, resistors R20 and R21 no longer act as a voltage divider and maximum voltage is applied to the grid of the tuning tube.

SERVICE DATA

Alignment Procedure

There are eight adjustments required for the alignment of the antenna, oscillator, and wave-trap tuned circuits. Six of these adjustments are made with plunger-type air trimming capacitors, and require the use of an **RCA Stock No. 12636 adjusting tool.** The other two adjustments are screws attached to molded magnetite cores and are used to adjust the wave-trap and to align the oscillator at **600 kc.** Before adjusting the plunger-type air trimmers, they must be unlocked by loosening their hexagon lock nuts. The lock nuts should be tightened upon completion of adjustments.

The i-f transformer adjustments are made by means of four screws attached to molded magnetite cores.

All of the adjustable circuits of this receiver have been properly aligned at the factory to give correct performance, and their settings should remain intact indefinitely when the receiver is used under ordinary

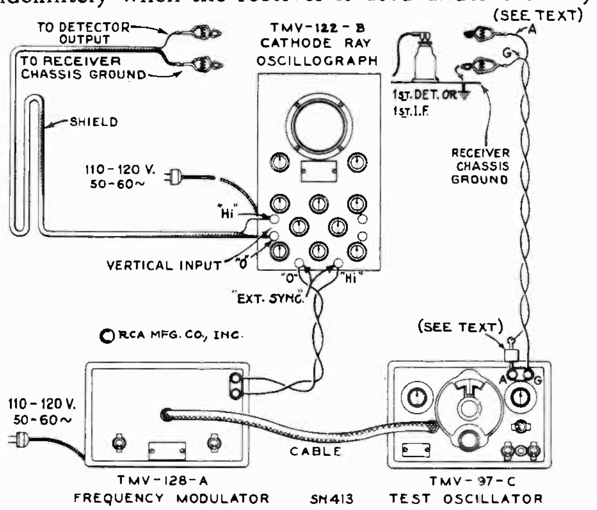


Figure 4—Alignment Apparatus Connections

conditions. However, necessity for re-adjustment may occasionally occur from continued extremes of temperature, climate, tampering, or purported alteration for services, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will generally exist simultaneously.

In re-adjusting the tuned circuits, it is important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator, such as an **RCA Stock No. 9595,** will be required as the source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. Two indication methods are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave image which represents the resonance characteristics of the circuits being tuned. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** The output indicator method should be performed with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator.** The two procedures are outlined as follows:

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 4. Remove the plug of the frequency modulator cable from the test oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 2. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume control setting is optional.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc,** place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws (see figures 3 and 7) of the second i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency modulator cable in test oscillator jack. Turn the test oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the RCA-6L7 first-detector grid cap through a **.001-mfd.** capacitor (with grid lead in place). Regulate the test oscillator output so that the amplitude of the oscillographic image is approximately the same as used above for adjustment (f).

(h) The two first i-f transformer magnetite core screws (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

Calibrate the pointer of the tuning dial by adjusting it to the extreme low-frequency end of dial scale (beyond 55 on dial) with the plates of the gang tuning condenser in full mesh. Alignment must be made in the sequence of "Short wave" band, "Medium wave" band, "Wave-trap," and "Standard broadcast" band.

"Short Wave" Band

(i) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **300-ohm** resistor. Remove the plug of the frequency modulator cable from the test oscillator. Turn test oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int."

(j) Set receiver range selector to its "Short wave" position and dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Set oscillator air trimmer **C13** to minimum capacity (plunger full out), and antenna air trimmer **C5** to maximum capacity (plunger full in). Slowly push in oscillator trimmer **C13** until maximum (peak) amplitude of output is reached. Two peaks may be found. Adjust **C13** to the peak with minimum capacity (plunger near out) for maximum indication. Tighten lock nut. Slowly pull out plunger of antenna air trimmer **C5** until maximum (peak) amplitude of output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut.

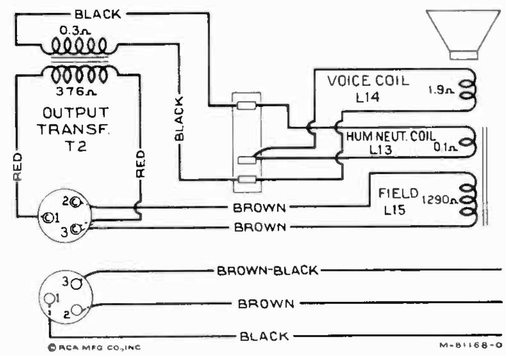


Figure 5—Loudspeaker Wiring

"Medium Wave" Band

(k) Place receiver range selector to its "Medium wave" position with the receiver dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Carefully adjust the oscillator and antenna air trimmers **C14** and **C6** respectively, so that each brings about maximum (peak) amplitude of output as shown by the wave on the oscillograph. When adjusting the oscillator trimmer **C14,** two peaks may be found. The one of minimum capacitance (plunger near out) should be used. Tighten lock nuts.

"Wave-Trap" Adjustment

(l) Connect the output of the test oscillator to the antenna terminal "A1" through a **200 mmfd. (important)** capacitor. Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the wave on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Standard Broadcast" Band

(m) Reduce output of test oscillator to minimum. Set receiver dial pointer to **600 kc.** Tune the test oscillator to **600 kc** and increase its output until a deflection is noticeable on the oscillograph screen.

(n) Adjust oscillator magnetite core screw (top of oscillator coil) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(o) Set receiver dial pointer to **1,500 kc.** Set the test oscillator to **1,500 kc** (1,500-3,100-kc range) and increase its output to produce a registration on the oscillograph. Carefully adjust the oscillator and antenna air trimmers **C16** and **C7** respectively so that each brings about maximum (peak) amplitude of output as shown by the waves on the oscillograph. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to "Lo" position and insert plug of the frequency modulator cable in test oscillator jack. Turn test oscillator modulation switch to "Off." Retune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test oscillator setting of **approximately 1,680 kc.** Adjust the trimmers **C16** and **C7** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(p) Remove the plug of the frequency modulator cable from test oscillator jack. Turn test oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc.** (200-400-kc range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** Third harmonic of **200 kc** is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency modulator cable in test oscillator jack. Turn test oscillator modulation switch to "Off." Retune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may come together, adjust the oscillator magnetite core screw (top of oscillator coil) to produce maximum amplitude of images. Shift oscillograph "Timing" switch to "Int." Remove the plug of the frequency modulator cable from the test oscillator. Turn test oscillator modulation switch to "On." Repeat adjustment (o), and then lock **C16** and **C7.**

Output Indicator Alignment

Attach the output indicator across the loudspeaker voice-coil circuit. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test oscillator output so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

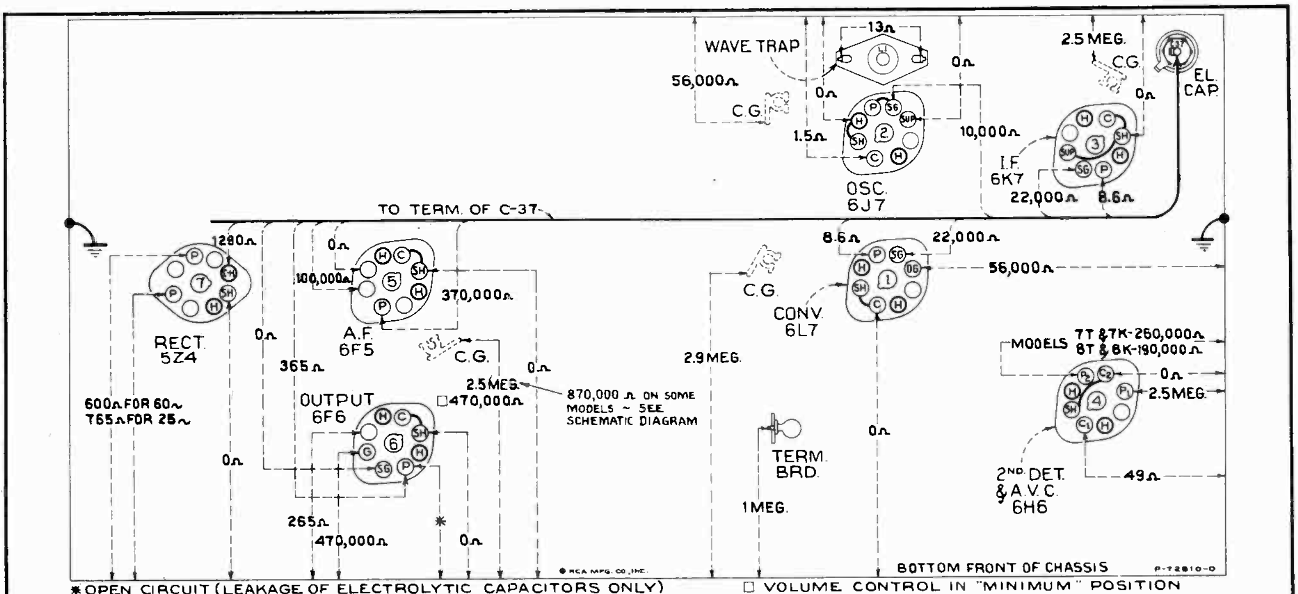


Figure 6—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 6, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with the Radiotrons in sockets, range selector in "Standard broadcast" position, tuning condenser in full mesh, and volume control set at maximum unless otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of the RCA-6L7 (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc,** place its modulation switch to "On" and its output switch to "Hi."

(b) Adjust the two magnetite core screws of the second i-f transformer (one on top and one on bottom), to produce maximum (peak) output.

(c) The two first i-f transformer magnetite core screws (one on top and one on bottom) should be adjusted to produce maximum (peak) output. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments.

R-F Adjustments

Calibrate the pointer of the tuning dial by adjusting it to the extreme low-frequency end of dial scale (beyond 55 on dial) with the plates of the gang tuning condenser in full mesh. Alignment must be made in sequence of "Short wave" band, "Medium wave" band, "Wave-trap", and "Standard broadcast" band.

"Short Wave" Band

(d) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **300-ohm** resistor, leaving the "Gnd." of the oscillator connected to the receiver chassis.

(e) Place range selector to its "Short wave" position. Set receiver dial pointer to **20,000 kc.** Adjust test oscillator to **20,000 kc.** Set oscillator air trimmer **C13** to minimum capacity (plunger full out), and antenna air trimmer **C5** to maximum capacity (plunger full in). Slowly push in oscillator trimmer **C13** until maximum (peak) output is reached. Two peaks may be found. Adjust **C13** to the peak with minimum capacity (plunger near out) for maximum indication. Tighten lock nut. Slowly pull out plunger of antenna air trimmer **C5** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut.

"Medium Wave" Band

(f) Place the receiver range selector to its "Medium

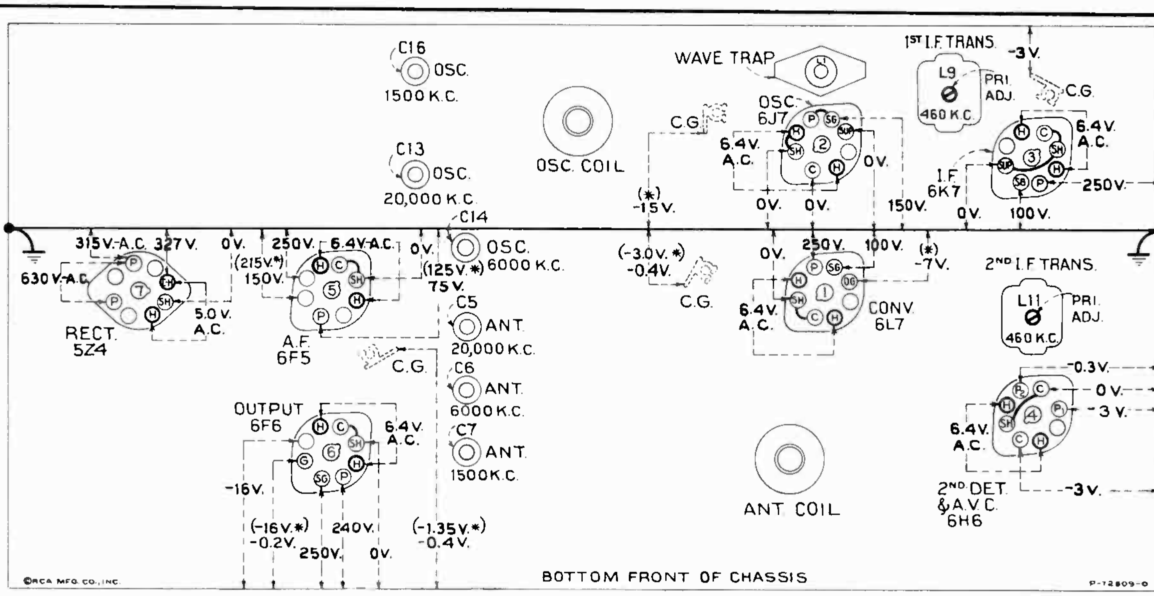


Figure 7—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum

Radiotron Socket Voltages

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc, no signal being received and volume control set at maximum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

wave" position, with the receiver dial pointer set to 6,000 kc. Tune test oscillator to 6,000 kc. Carefully adjust the oscillator and antenna air trimmers **C14** and **C6** respectively, so that each brings about maximum (peak) output. When adjusting the oscillator trimmer **C14**, two peaks may be found. The one of minimum capacitance (plunger near out) should be used.

"Wave-Trap" Adjustment

(g) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a 200 **mmfd. (important)** capacitor. Place the range selector to its "Standard broadcast" position and set the receiver dial pointer to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum output (maximum suppression of signal). An increase of the test-oscillator output may be necessary before the point of minimum output, obtained by adjustment of wave-trap screw, becomes apparent on the output indicator.

"Standard Broadcast" Band

(h) Reduce output of test oscillator to a minimum. Tune the test oscillator to **600 kc** and set receiver dial pointer to **600 kc.** Adjust output of test oscillator until a slight indication of output is visible.

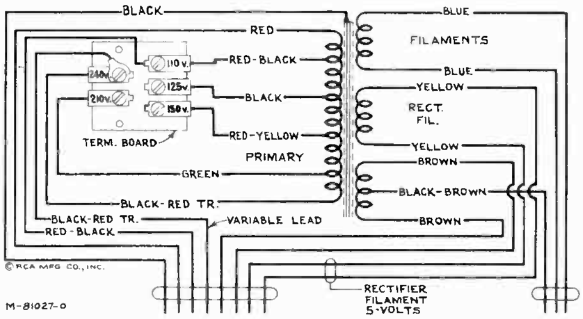
(i) Adjust the oscillator magnetite core screw (top of oscillator coil) so that maximum (peak) output results.

(j) Set receiver dial pointer to **1,500 kc.** Tune the test oscillator to **1,500 kc.** Carefully adjust the oscillator and antenna air trimmers **C16** and **C7** respectively so that each brings about maximum (peak) output.

(k) Tune the test oscillator to **600 kc.** Tune the receiver to pick up this signal disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw (top of oscillator coil) for maximum (peak) output while rocking gang tuning condenser. After completing this adjustment, the trimmers **C16** and **C7** should be re-adjusted as in (j) to correct for any change in the oscillator high-frequency tuning which has been caused by the preceding adjustment.

Antenna and Ground Terminals

These receivers are equipped wih an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission



Primary resistance—24.5 ohms total
Secondary resistance—668 ohms total

Figure 8—Universal Transformer

line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 1).

REPLACEMENT PARTS

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

Stock No.	Description	List Price	Stock No.	Description	List Price
	RECEIVER ASSEMBLIES		12714	Capacitor—Adjustable capacitor (C5, C6, C7, C13, C14, C16)	.38
12706	Arm—Hub and arm complete for operating shutter (located on range switch shaft)	.22	12722	Capacitor—18 Mmfd. (C15)	.20
12716	Board—Antenna and ground terminal board	.20	12723	Capacitor—56 Mmfd. (C9)	.20
12717	Board—Phonograph terminal board	.22	12726	Capacitor—56 Mmfd. (C2)	.20
5237	Bushing—Variable capacitor mounting bushing assembly—Package of 3	.43	12724	Capacitor—120 Mmfd. (C18, C32)	.28
12730	Cable—Shielded cable approximately 14½-in. long—volume control to phono terminal board	.40	12404	Capacitor—120 Mmfd. (C20, C22, C23, C24)	.26
11625	Cable—Tuning tube cable and socket complete (Models 8T and 8K)	1.26	12725	Capacitor—150 Mmfd. (C1)	.28
12511	Cap—Grid contact cap—Package of 5	.15	12406	Capacitor—180 Mmfd. (C25)	.26
			12727	Capacitor—555 Mmfd. (C12)	.20
			12537	Capacitor—560 Mmfd. (C3)	.20
			12729	Capacitor—1,550 Mmfd. (C11)	.26
			12728	Capacitor—4,500 Mmfd. (C10)	.36
			4868	Capacitor—.005 Mfd. (C19, C35)	.20
			4858	Capacitor—.01 Mfd. (C26, C27, C31)	.25

Prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
11315	Capacitor—.015 Mfd. (C33)	.20
12670	Capacitor—.035 Mfd. (C34)	.20
4836	Capacitor—.05 Mfd. (C40) (Models 8T and 8K)	.30
4841	Capacitor—0.1 Mfd. (C29)	.22
11414	Capacitor—0.1 Mfd. (C30)	.20
4840	Capacitor—0.25 Mfd. (C28)	.30
5170	Capacitor—0.25 Mfd. (C8, C21)	.25
11240	Capacitor—10 Mfd. (C36)	1.08
5212	Capacitor—18 Mfd. (C37)	1.16
12708	Coil—Antenna coil and shield (L2, L3, L4, L5)	2.04
12709	Coil—Oscillator coil and shield (L6, L7, L8)	2.02
12701	Condenser—2-gang variable tuning condenser (C4, C17)	4.00
5119	Connector—3-contact female connector for speaker cable	.25
12711	Core—Adjustable core and stud for Stock No. 12709	.16
12006	Core—Adjustable core and stud for Stock No. 12652 and 12653	.22
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12703	Dial—Station selector dial scale	.80
12702	Drive—Vernier drive for tuning capacitor	.68
12712	Indicator—Station selector indicator pointer	.22
5226	Lamp—Indicator dial lamp 6.3 volt—Package of 5	.70
12718	Mask—Dial light diffuser complete with red, orange and green colored screen	.40
12738	Resistor—27,000 ohms, insulated, 1/4 watt—Package of 5 (R10)	1.00
11282	Resistor—56,000 ohm, carbon type 1/10 watt—Package of 5 (R8)	.75
12286	Resistor—56,000 ohm, carbon type, 1/4 watt—Package of 5 (R2)	1.00
11282	Resistor—56,000 ohm, carbon type, 1/10 watt—Package of 5 (R4)	.75
11281	Resistor—100,000 ohm, carbon type, 1/10 watt—Package of 5 (R13)	.75
11398	Resistor—220,000 ohm, carbon type, 1/10 watt—Package of 5 (R9)	.75
11453	Resistor—270,000 ohm, carbon type, 1/10 watt—Package of 5 (R14)	.75
11452	Resistor—470,000 ohm, carbon type, 1/10 watt—Package of 5 (R1, R15)	.75
12285	Resistor—470,000 ohm, insulated, 1/4 watt—Package of 5 (R12)	1.00
12013	Resistor—1 meg., carbon type, 1/10 watt—Package of 5 (R22) (Models 8T and 8K)	.75
11626	Resistor—2.2 meg., carbon type, 1/4 watt—Package of 5 (R7, R20, R21)	1.00
12004	Resistor—Voltage divider comprising one 216 ohm, one 27 ohm and one 22 ohm sections (R17, R18, R19)	.45
12715	Resistor—Wire wound comprising one 22,000 ohm and one 10,000 ohm sections (R3, R6)	.86
4669	Screw—No. 8-32 set screw for arm Stock No. 12706—Package of 10	.25
12651	Shield—Coil shield for Stock No. 12708	.22
12710	Shield—Coil shield for Stock No. 12709	.28
12735	Shield—Dial lamp shield—Package of 5.	.25
12008	Shield—I.F. transformer shield for Stock No. 12652 and 12653	.28
12581	Shield—Shield top for I.F. transformer Stock No. 12653	.36
12607	Shield—Shield top for I.F. transformer Stock No. 12652	.30
12704	Shutter—Dial scale holder and shutter assembly for band indicator	.88
11195	Socket—5-contact 5Z4 radiotron socket	.15
11198	Socket—7-contact 6J7, 6K7 or 6L7 radiotron socket	.15
11196	Socket—8-contact 6F5, 6F6, 6H6, radiotron socket	.15
11222	Socket—Dial lamp socket	.18
11381	Socket—Tuning tube socket and cover (Models 8T and 8K)	.45
12007	Spring—Retaining spring for core Stock No. 12006, 12664 and 12711—Package of 10	.36
12849	Spring—Tension spring for band indicator shutter link—Package of 5	.18
12707	Switch—Range switch (S1, S2)	1.64
12668	Tone Control—Control and operating switch (R16, S3)	1.22
12652	Transformer—First I.F. transformer complete (L9, L10, C20, C22)	1.60
11999	Transformer—Power transformer 105-125 volts, 60 cycle (T1)	3.80
12132	Transformer—Power transformer 105-125 volts, 25 cycle (T1)	5.48
12133	Transformer—Power transformer 100-250 volts, 60 cycle (T1)	6.25
12653	Transformer—Second I.F. transformer complete (L11, L12, C23, C24, C25, R8, R9)	2.06
12654	Trap—Wave trap complete (L1)	.75
13144	Volume Control (R11)	1.00
	REPRODUCER ASSEMBLIES	
12641	Board—Reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket	.18
12012	Coil—Field coil (L15)	1.85
11469	Coil—Neutralizing coil (L13)	.20
12642	Cone—Reproducer cone and dust cap (L14) (Models 7T and 8T)	.94
12667	Cone—Reproducer cone and dust cap (L14) (Models 7K and 8K)	1.00
5118	Connector—3-contact male connector for speaker cable	.25
12666	Cover—Speaker cover (Models 7K and 8K)	.65
9696	Reproducer Complete—(Models 7K and 8K)	6.90
9699	Reproducer Complete—(Models 7T and 8T)	6.38
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket (Models 8T and 8K)	.22
12698	Crystal—Station selector crystal and escutcheon	1.02
12742	Escutcheon—Tuning tube escutcheon (Models 8T and 8K)	.22
12699	Knob—Large tuning knob—Package of 5	.68
11582	Knob—Tone control knob—Package of 5	.50
12700	Knob—Vernier tuning knob (small)—Package of 5	.58
11347	Knob—Volume control or range switch knob—Package of 5	.75
11377	Screw—Chassis mounting screw assembly for Table Model—Package of 4	.12
11210	Screw—Chassis mounting screw assembly for Console Model—Package of 4	.28
4982	Spring—Retaining spring for knob Stock No. 12699—Package of 10	.50
11349	Spring—Retaining spring for knob Stock No. 11347, 11582 and 12700—Package of 5	.25

First Edition **Prices quoted above are subject to change without notice.**

RCA VICTOR MODEL 7U

Seven-Tube, Three-Band, A-C, Radio—Phonograph

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Standard broadcast" (A) .... 540- 1,625 kc.
"Medium wave" (B) .... 1,625- 5,700 kc.
"Short wave" (C) .... 5,700-18,000 kc.

ALIGNMENT FREQUENCIES

"Standard broadcast" (A) ... 600 kc. (osc.), 1,400 kc. (osc. and ant.)
"Medium wave" (B) .... None required
"Short wave" (C) .... 15,000 kc. (osc. and ant.)

Intermediate Frequency .... 460 kc.

RADIOTRON COMPLEMENT

(1) RCA-6A8 .... First-detector–oscillator
(2) RCA-6K7 .... Intermediate amplifier
(3) RCA-6H6 .... Second-detector–a.v.c.
(4) RCA-6F5 .... Audio voltage amplifier
(5) RCA-6F6 .... Audio power amplifier
(6) RCA-5Z4 .... Full-wave rectifier
(7) RCA-6E5 .... Tuning tube

Pilot Lamps (5) .... Mazda No. 46, 6.3 volts, 0.25 amperes

POWER SUPPLY RATINGS

Rating A-6 .... 105-125 volts, 60 cycles, 95 watts
Rating A-5 .... 105-125 volts, 50 cycles, 95 watts
Rating B-2 .... 105-125 volts, 25 cycles, 95 watts
Rating C-6 .... 105-130/140-160/200-250 volts, 60 cycles, 95 watts
Rating C-5 .... 105-130/140-160/200-250 volts, 50 cycles, 95 watts

POWER OUTPUT

Undistorted .... 2.0 watts
Maximum .... 4.5 watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (v.c.) .... 2.2 ohms at 400 cycles

PHONOGRAPH

Type .... Manual
Turntable Speed .... 78 r.p.m.
Type of Pickup .... High-impedance magnetic
Pickup Impedance .... 1,400 ohms at 1,000 cycles

Mechanical Specifications

Height .... $40\frac{3}{16}$ inches
Width .... $23\frac{9}{16}$ inches
Depth .... $14\frac{3}{8}$ inches
Weight (net) .... 71 pounds
Weight (shipping) .... 91 pounds
Chassis Base Dimensions .... 12 inches x 7 inches x $2\frac{1}{2}$ inches
Over-all Chassis Height .... 8 inches
Operating Controls. (1) Power switch–Tone, (2) Tuning, (3) Volume, (4) Range selector, (5) Radio–Phono-volume
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

The Model 7U combination instrument consists of a seven-tube radio receiver and a manually-operated phonograph combined in one cabinet. The superheterodyne circuit is used with such features of design as: Antenna wave-trap, aural compensated volume control, continuously variable tone control with music-voice switch, automatic volume control, resistance-coupled audio system, tuning tube "Magic Eye," and band selective indication of dial scales. The tuning range is continuous through the "Standard broadcast" band, "Medium wave" band, and the "Short wave" band. It includes domestic broadcast, police, aircraft, and amateur services, and also the important foreign short-wave broadcast bands at 49, 31, 25, 19, and 16 meters.

Circuit Arrangement

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A8. The input of this tube is coupled to the antenna through a tuned transformer. This transformer consists of a single primary and three series-connected secondary windings to provide the three ranges of tuning. The oscil-

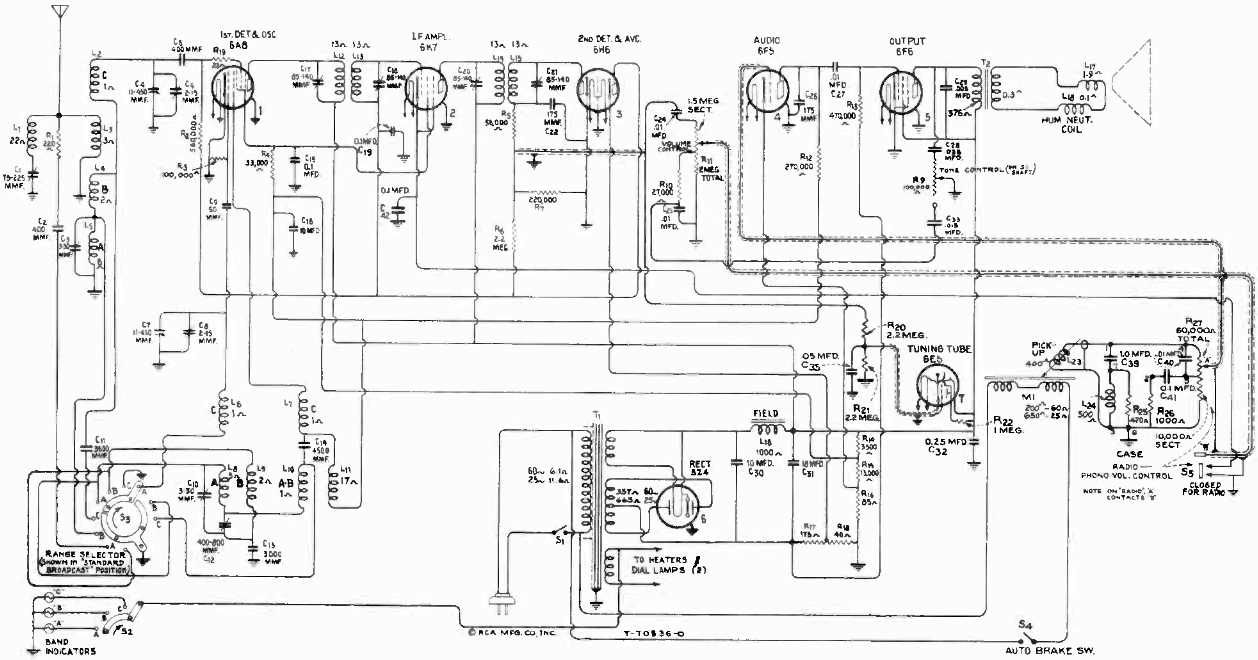


Figure 1—Schematic Circuit Diagram

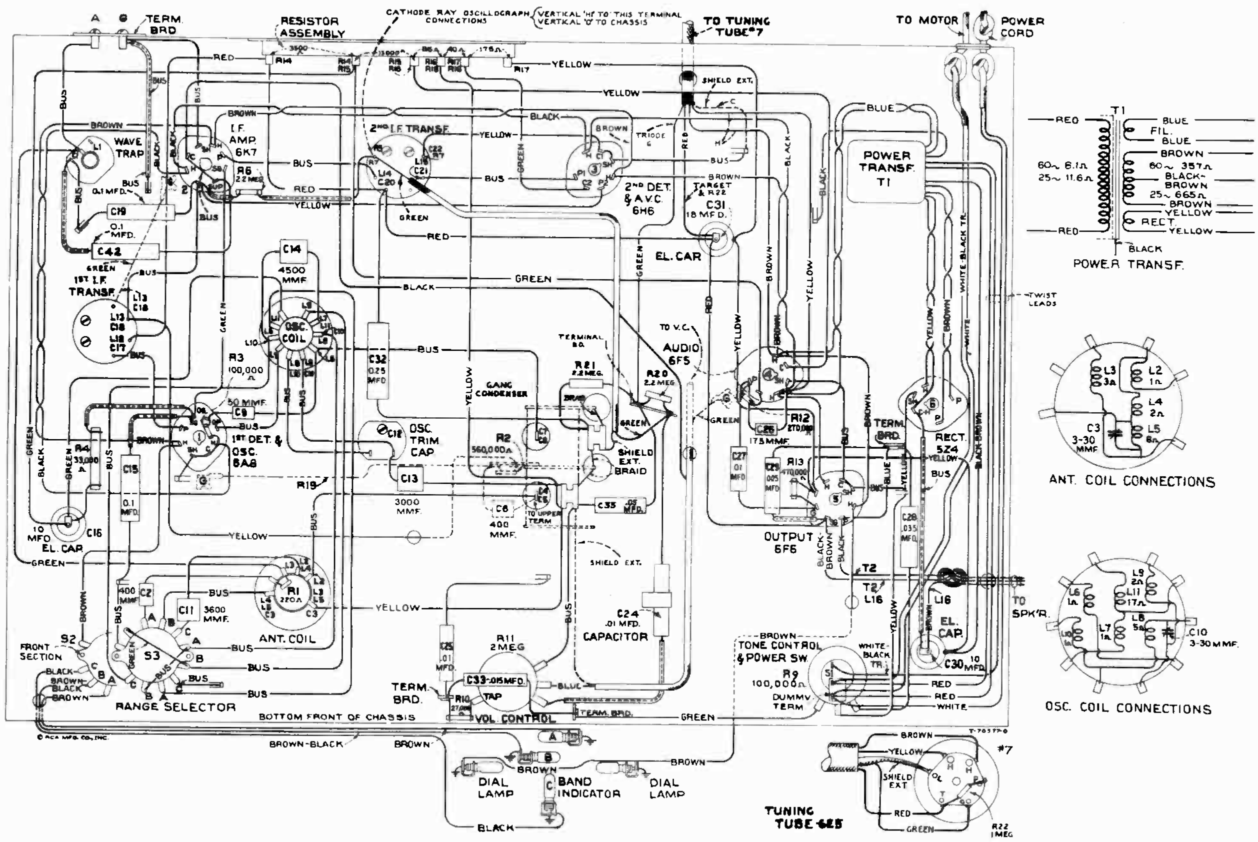


Figure 2—Chassis Wiring Diagram

lator coil system is similarly wound on a single form. A range-selector switch S3 is used for connecting the various sections of these two coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable two-section gang condenser having trimming capacitors in shunt with each section. There are additional trimming capacitors across the section of each coil used for the "Standard broadcast" band. A series trimming capacitor is also associated with the "Standard broadcast" oscillator coil.

The intermediate-frequency stage is coupled to the RCA-6A8 and to the RCA-6H6 by means of tuned transformers. The windings of these transformers (both primary and secondary) are resonated with adjustable trimming capacitors to tune to 460 kc.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 twin-diode tube. Audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage which develops across resistor R7 is applied as automatic control-grid bias to the first detector and i-f tubes. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R6 and R7, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current, and the a.v.c. diode takes over the biasing function.

Manual volume control is effected by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first-audio control grid. After amplification by the RCA-6F5, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-6F6 power-output stage, which, in turn, is transformer-coupled to the dynamic loudspeaker.

Continuously-variable tone control is effected by means of the combination of a capacitor C28 and variable resistor R9 shunting the plate circuit of the output tube. Extreme clockwise rotation of the tone control disconnects the resistor R9 from the circuit and places an additional capacitor, C33, in shunt with capacitor C25, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section, built in the same glass envelope. A component of the signal voltage developed across resistor R7 is used to actuate the control grid of the amplifier section.

The power-supply system consists of an RCA-5Z4 rectifier tube, which is supplied from an efficiently designed power transformer, and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits, are obtained from the output of the filter. The electrodynamic loudspeaker field coil is used as a filter reactor.

The phonograph mechanism is of the manually operated type, having a synchronous motor which

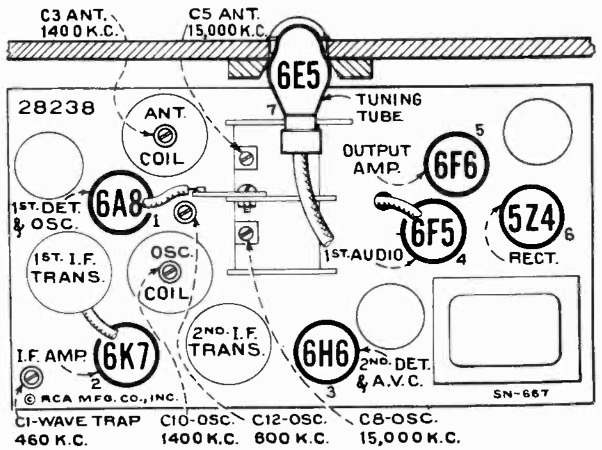


Figure 3—Radiotron, Coil, and Trimmer Locations

rotates the turntable at a speed of 78 r.p.m. The 10-inch turntable will accommodate either the 10-inch or 12-inch phonograph records. The pickup mechanism and tone arm are combined as one unit. The instrument may be purchased with any one of five ratings as specified under Electrical Specifications. *It is important that a machine of any particular rating be operated at the frequency and voltage for which it is rated.* Attempts to operate at ratings other than specified for the particular instrument will result in improper reproduction from the phonograph and may result in damage to both the phonograph motor and radio receiver. An automatic switch is provided to turn "off" the phonograph motor at the completion of the record.

SERVICE DATA

Alignment Procedure

There are six adjustments required for the alignment of the antenna, oscillator, and wave-trap tuned circuits. The i-f transformer adjustments are made by four trimming capacitor screws. Improper alignment usually causes the impairment of sensitivity, selectivity, and tone quality. Such conditions will usually exist simultaneously.

A standard test oscillator, such as the **RCA Stock No. 9595,** will be required as a source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Glow Indicator** is designed for this purpose.

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output control so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

(a) Connect the test oscillator to the grid cap of the RCA-6A8 through a **.001 mfd.** capacitor, and connect the test oscillator ground to the receiver chassis. Set test oscillator to **460 kc.**

(b) Adjust the two trimming capacitors **(C20** and **C21)** of the second i-f transformer to produce maximum (peak) output.

(c) Adjust the two trimming capacitors **(C17** and **C18)** of the first i-f transformer, to produce maximum (peak) output.

It is advisable to repeat the adjustment of all i-f trimming capacitors a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme end calibration mark (beyond 55 on dial) while the two-gang tuning condenser plates are in full mesh. Alignment (see figure 3 for location of trimming adjustments) of "Wave-trap," "Short wave" band, and "Standard broadcast" band should be made in the following order and sequence.

"Wave-Trap"

(a) Connect the output of the test oscillator to the antenna terminal through a **200-mmfd. (important)** capacitor, leaving the test oscillator ground connected to the receiver chassis. With the range selector in its "Standard broadcast" position, set the receiver dial to a position of no extraneous signals, near **600 kc** (60 on dial). Set the test oscillator to **460 kc.** Adjust the wave-trap trimming capacitor **C1** to a point which causes minimum amplitude of output. An increase of the test oscillator output may be necessary before the point of minimum amplitude, obtained by adjustment of wave-trap screw, becomes apparent on the output indicator.

"Short Wave" Band

(a) Connect the output of the test oscillator to the antenna terminal through a **300-ohm** resistor, leaving the test oscillator ground connected as before.

(b) Set the range selector to its "Short wave" position. Set receiver dial pointer to **15,000 kc** (15 on dial). Adjust the test oscillator

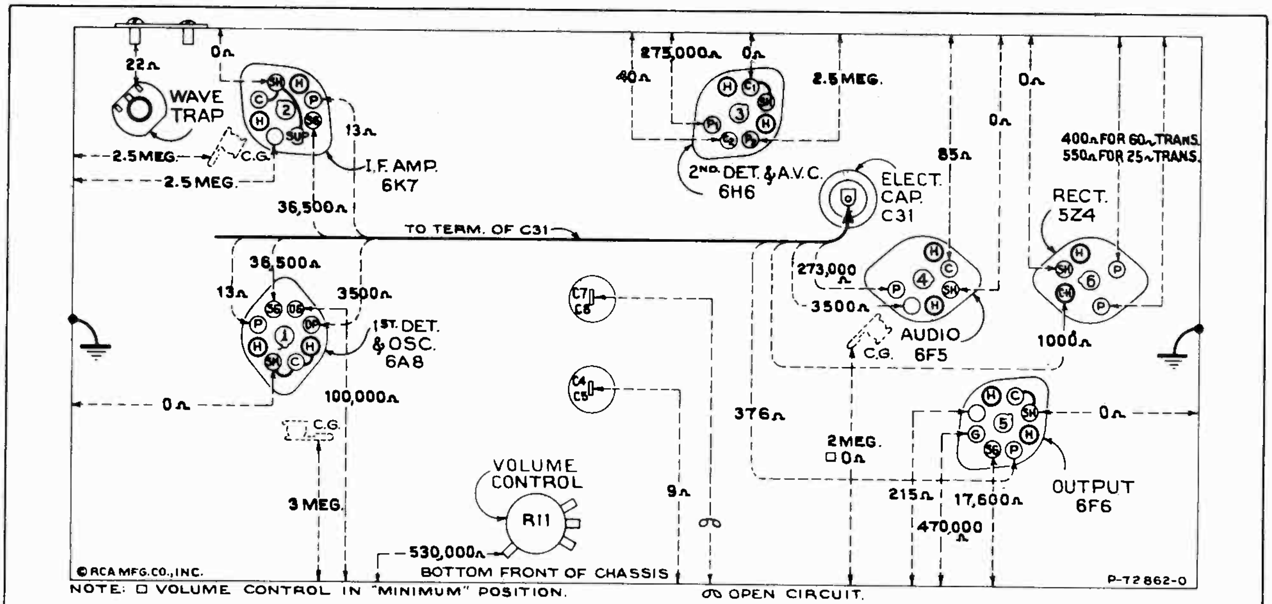
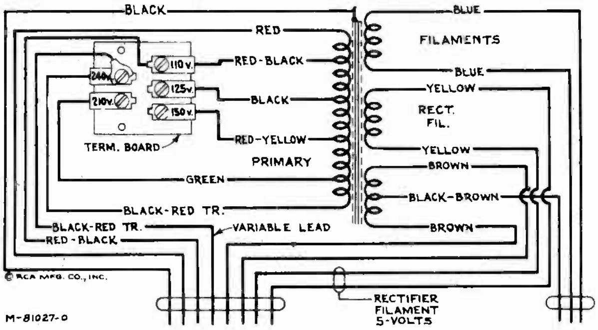


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full mesh
Range selector "Standard broadcast"—Radio–Phono-volume "Radio"—Radio volume control maximum

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 4, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. Resistance values were measured with Radiotrons in sockets, tuning condenser in full mesh, and volume control set at maximum except where otherwise noted. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

to **15,000 kc.** Adjust the oscillator trimming capacitor **C8** to the point which produces maximum (peak) output. Two points may be found, each of which produces a maximum. The one of maximum trimmer capacitance (most clockwise) is correct and should be used.



Primary Resistance—17.3 ohms total
Secondary Resistance—355 ohms total

Figure 5—Universal Transformer

(c) Adjust the antenna trimming capacitor **C5** of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **15,000 kc** input signal, until maximum (peak) output results from these combined operations.

"Standard Broadcast" Band

(a) Connect the output of the test oscillator to the antenna terminal through a **200-mmfd.** capacitor, leaving test oscillator ground connected as before.

(b) Set the range selector to its "Standard broadcast" position. Set the receiver dial pointer

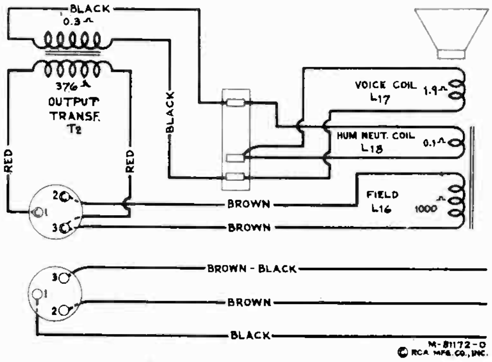


Figure 6—Loudspeaker Wiring

to **1,400 kc (140** on dial). Adjust the test oscillator to **1,400 kc.** Adjust the oscillator and antenna trimming capacitors, **C10** and **C3** respectively, to the points where each produces maximum (peak) output.

(c) Shift the test oscillator frequency to **600 kc** and tune the receiver to pick up this signal,

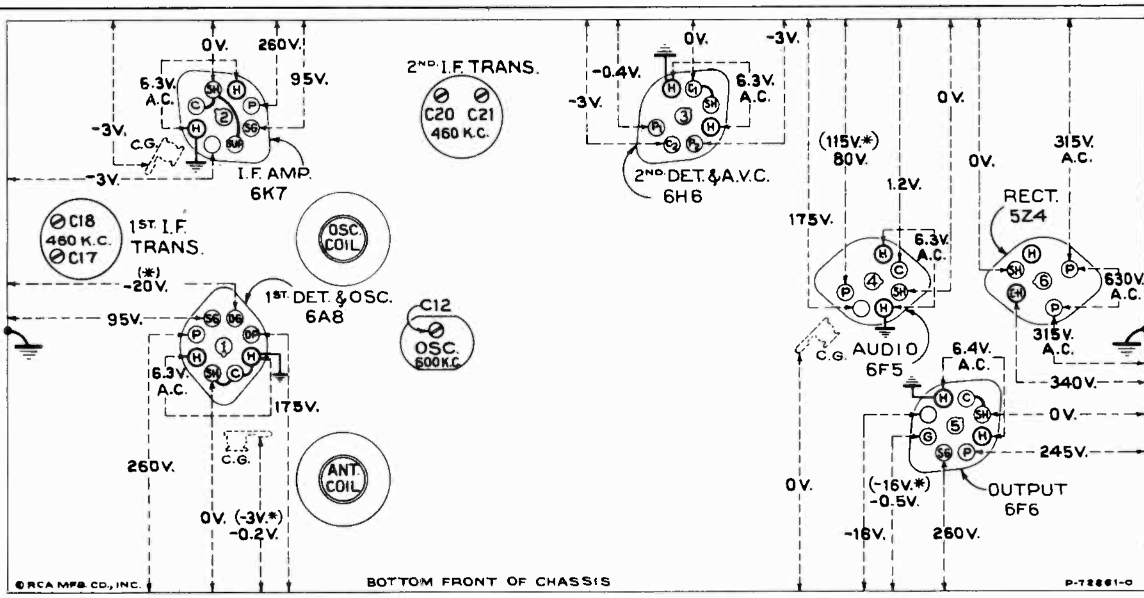


Figure 7—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc "Standard broadcast" Radio–Phono-volume "Radio"—No signal being received—Volume control minimum

Note: *Two voltage values are shown for some readings. The higher value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause of faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. These voltages were measured with receiver tuned to approximately 1,000 kc, no signal being received, and volume control set at minimum. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

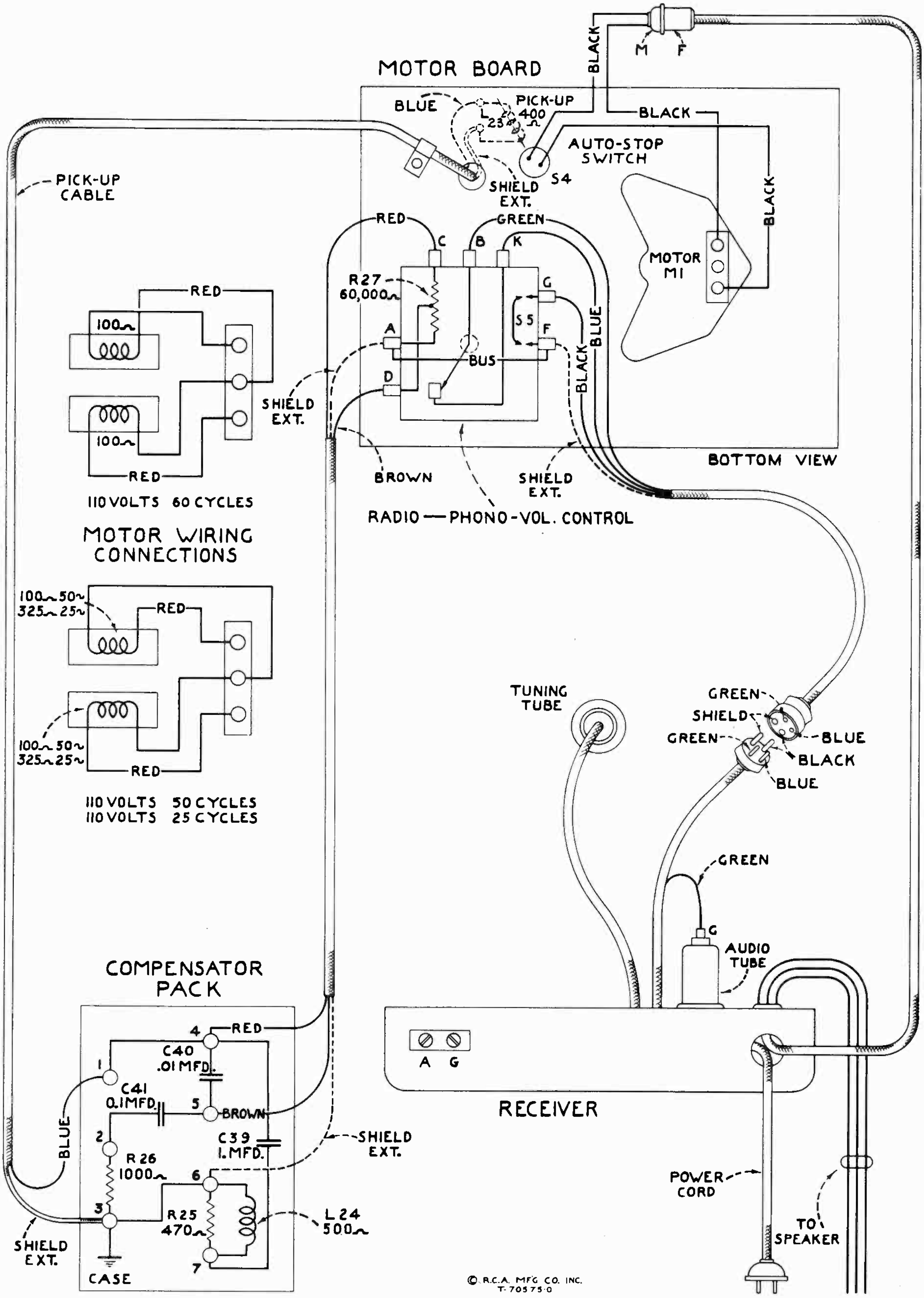


Figure 8—Assembly Wiring

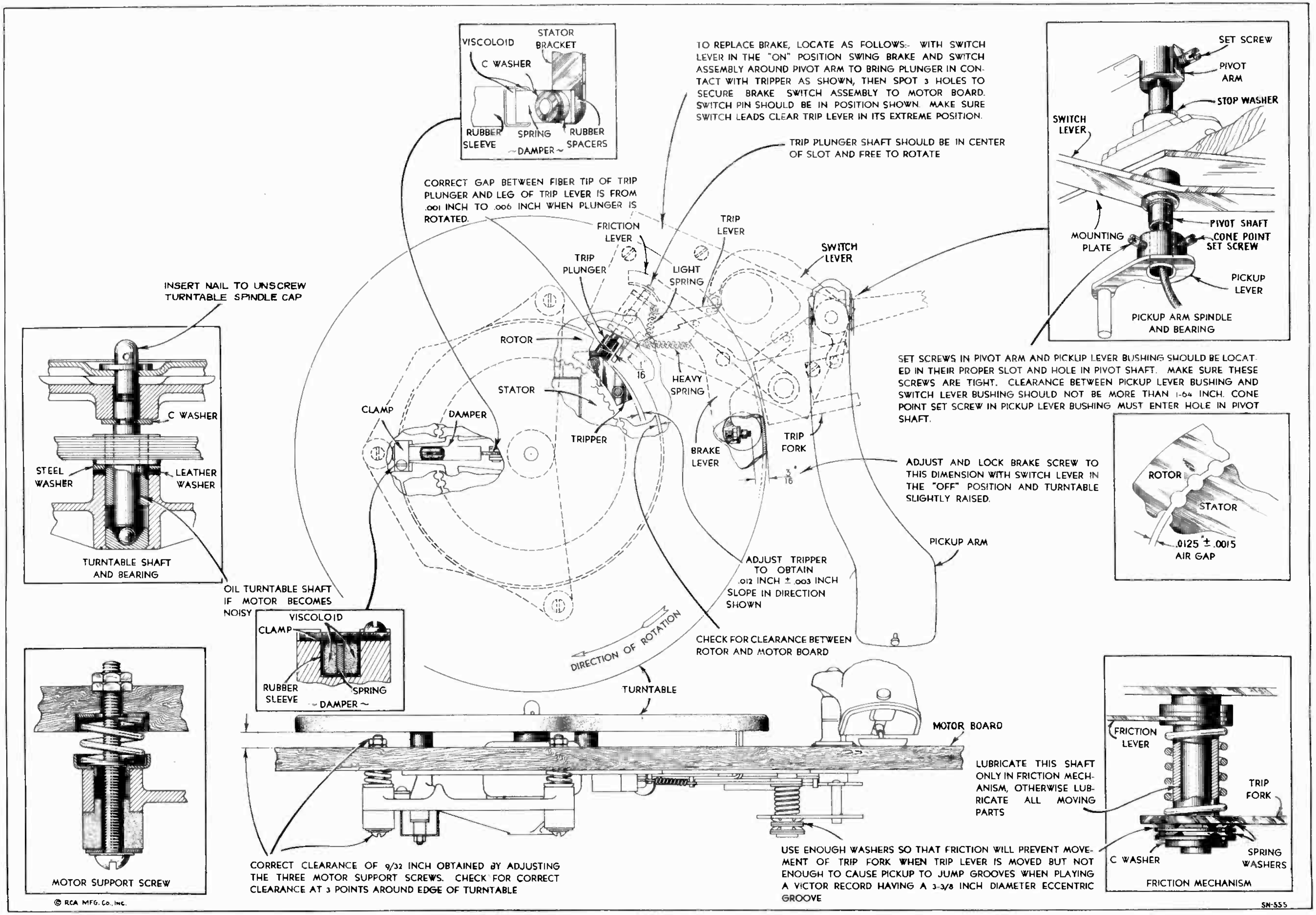


Figure 9—Motor Board Adjustments

disregarding the dial reading at which it is best received.

(d) Adjust the low-frequency oscillator trimming capacitor, C12, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum (peak) output results from these combined operations. Repeat adjustments in (b) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimming capacitor.

Phonograph Mechanism

The phonograph motor is of the synchronous type and designed to be simple and foolproof. Under normal operating conditions, service difficulties should

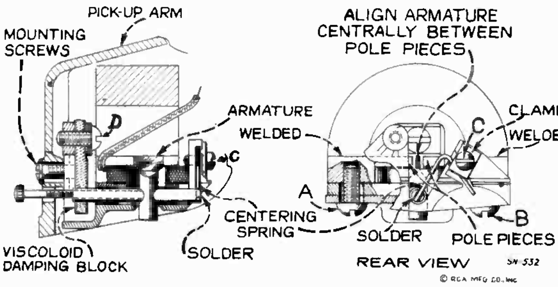


Figure 10—Details of Pickup

be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 9.

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

Centering Armature

Refer to figure 10 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i. e., exactly centered. Whenever this centering adjustment has been disturbed it will be necessary to remove the pickup mechanism from the tone arm by removing the needle holding screw and the two mounting screws from the front of the tone arm, holding the pickup assembly to keep it from dropping. Unsolder the two leads from the lugs on the terminal board at the rear of the pickup. Insert a small rod or nail into the armature needle hole and replace the needle holding screw, tightening it to hold the rod securely. If the armature clamping screws A and B have not been disturbed, screw C should be loosened which will permit the armature to be moved from side to side, the rod acting as a lever to perform this operation. The proper adjustment is obtained when the armature is moved to the extreme position on each side (the movement being limited by the armature striking the pole pieces) and then brought to the mid position between these two extremes. Screw C should then be tightened. The armature position should then be central between the pole pieces and at right angles to them. With a little practice, the correct adjustment of the armature will be obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other foreign material which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid damping block which is attached to the front end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, the pickup mechanism should be removed from the tone arm as explained above. Unsolder the pickup coil leads from the two lugs on the pickup terminal board and remove the terminal board mounting screw and the terminal board. Then remove screw D and the damping block from the pickup assembly. Make sure that the shaft of the armature which contacts the viscoloid is clean. Then insert the new damping block so that it occupies the same position as that of the original block, and is in correct vertical alignment with the armature. The hole in the block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the damping block properly aligned on the armature, screw D with its washer should then be replaced. Heat should be applied to the armature (viscoloid side) so that the damping block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron, constructed as shown in figure 11, will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block, causing a small bulge on both sides.

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. Remove the pickup mechanism and terminal board as described above. Remove screws A and B and the magnet assembly. Remove the bakelite coil support (with coil attached) and insert the new coil

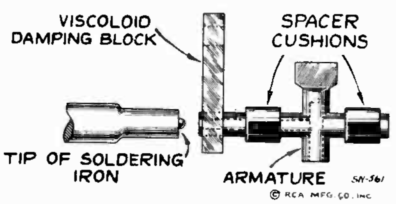


Figure 11—Special Soldering-Iron Tip

support assembly in its place, after which replace the magnet assembly and center the armature as described above, then re-assemble the remainder of the unit. Only rosin core solder should be used for soldering the coil leads and pickup leads to the pickup terminal board. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to remagnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to remagnetize it so that the same polarity is maintained.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12930	Board—Antenna and ground terminal board	$0.20
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11888	Cable—Tuning lamp cable and socket	1.06
12032	Cable—3-conductor, shielded, volume control cable, approx. 8 inches long, complete with 4-contact male connector and grid contact cap	.90
11350	Cap—Grid contact cap—Package of 5	.20
12511	Cap—Grid contact cap—Package of 5	.15
11289	Capacitor—50 Mmfd.—(C9)	.26
11623	Capacitor—175 Mmfd.—(C22, C26)	.18
11290	Capacitor—400 Mmfd. (C2, C6)	.25
11622	Capacitor—3000 Mmfd.—(C13)	.36
11621	Capacitor—3600 Mmfd.—(C11)	.38
11287	Capacitor—4500 Mmfd.—(C14)	.30
4868	Capacitor—.005 Mfd.—(C29)	.20
11315	Capacitor—.015 Mfd.—(C33)	.20
12670	Capacitor—.035 Mfd.—(C28)	.20
11395	Capacitor—.01 Mfd.—(C24)	.18
4858	Capacitor—.01 Mfd.—(C25, C27)	.25
4836	Capacitor—.05 Mfd.—(C35)	.30
11414	Capacitor—0.1 Mfd.—(C15, C42)	.20
4841	Capacitor—0.1 Mfd.—(C19)	.22
5170	Capacitor—.25 Mfd.—(C32)	.25
11240	Capacitor—10 Mfd.—(C30)	1.08
11387	Capacitor—10 Mfd.—(C16)	.86
5212	Capacitor—18 Mfd.—(C31)	1.16
11465	Capacitor—Adjustable trimmer—(C12)	.48
11256	Capacitor—Adjustable trimmer for wave-trap, Stock No. 11391—(C1)	.48
11617	Coil—Antenna coil less shield—(L2, L3, L4, L5, C3, R1)	1.68
11618	Coil—Oscillator coil less shield—(L6, L7, L8, L9, L10, L11, C10)	2.22
12767	Condenser—2-gang variable tuning condenser—(C4, C5, C7, C8)	4.10
4573	Connector—2-contact female connector for motor cable—receiver section	.30
5119	Connector—3-contact female connector for chassis reproducer cable	.25
6123	Connector—4-contact male connector for cable, Stock No. 12032	.30
12768	Drive—Variable tuning condenser vernier drive	1.30
11619	Foot—Chassis mounting foot and bracket assembly—Package of 2	.65
12770	Holder—Dial scale holder and lamp bracket assembly	.55
12712	Indicator—Station selector indicator pointer	.22
4340	Lamp—Dial lamp—Package of 5	.60
12718	Mask—Dial light diffuser complete with red, orange and green-colored screen	.40
11466	Resistor—Voltage divider—comprising one 3,500-ohm, one 13,000-ohm, one 85-ohm, one 40-ohm and one 175-ohm sections—(R14, R15, R16, R17, R18)	$0.95
11624	Resistor—22 ohms—Flexible type complete with grid contact cap—(R19)	.22
11620	Resistor—220 ohms—Carbon type—1/10 watt—(R1)—Package of 5	.75
11400	Resistor—27,000 ohms—Carbon type—¼ watt—(R10)—Package of 5	1.00
8072	Resistor—33,000 ohms—Carbon type—½ watt—(R4)—Package of 5	1.00
11282	Resistor—56,000 ohms—Carbon Type——1/10 watt—(R5)—Package of 5	.75
12263	Resistor—100,000 ohms—insulated—¼ watt—Package of 5—(R3)	1.00
11398	Resistor—220,000 ohms—Carbon type—1/10 watt—(R7)—Package of 5	.75
11453	Resistor—270,000 ohms—Carbon type—1/10 watt—(R12)—Package of 5	.75
11452	Resistor—470,000 ohms—Carbon type—1/10 watt—(R13)—Package of 5	.75
11397	Resistor—560,000 ohms—Carbon type—1/10 watt—(R2)—Package of 5	.75
12013	Resistor—1 megohm—Carbon type—1/10 watt—(R22)—Package of 5	.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R6, R20, R21)—Package of 5	1.00
11603	Shield—Coil shield for Stock Nos. 11617 and 11618	.26
12735	Shield—Dial lamp shield—Package of 5	.25
11390	Shield—I. F. transformer shield for Stock Nos. 11388 and 11389	.25
11199	Socket—Dial lamp socket	.14
12771	Socket—Dial lamp socket—Located at top of dial scale	.25
11381	Socket—Tuning lamp socket and cover	.45
11195	Socket—5-contact 5Z4 Radiotron socket	.15
11198	Socket—7-contact 6F5 or 6H6 Radiotron socket	.15
11196	Socket—8-contact 6A8, 6F6 or 6K7 Radiotron socket	.15
12769	Switch—Range switch—(S2, S3)	1.25
12668	Tone Control and Power Switch—(R9, S1)	1.22
11391	Trap—Wave trap—(L1, C1)	1.22
11388	Transformer—First I. F. transformer less shield—(L12, L13, C17, C18)	1.90
11389	Transformer—Second I. F. transformer less shield—(L14, L15, C20, C21, C22, R5, R7)	3.02
11848	Transformer—Power transformer—100-125-volts, 50-60 cycles—(T1)	4.40
11849	Transformer—Power transformer—100-125-volts, 25-40 cycles—(T1)	5.70
11850	Transformer—Power transformer—105-250-volts, 40-60 cycles—(T1)	8.00
13144	Volume control—(R11)	1.00

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
	MOTOR BOARD ASSEMBLIES	
11751	Bushing—Motor mounting bushing and spring assembly, comprising one bushing, one large washer, one cup washer, one spring, one small washer and two nuts	$0.25
13065	Lever—Brake mechanism actuating lever, fastens to pivot shaft under base	.20
3261	Rest—Pickup rubber rest—Package of 5	.40
11750	Screw—No. 4-40 x 9/32, cone pointed, headless set screw for lever, Stock No. 13065—Package of 10	.22
	AUTOMATIC BRAKE AND SWITCH ASSEMBLIES	
13099	Brake—Automatic brake and switch complete	4.90
4577	Connector—2-contact male connector for brake switch power supply leads	.30
12932	Lever—Friction lever assembly complete	.35
11753	Plunger—Automatic brake trip plunger	.18
12043	Screw—Automatic brake screw and friction leather assembly	.20
11756	Spring—Automatic brake trip lever spring—Package of 10	.22
11757	Spring—Automatic brake lever spring—Package of 10	.20
11755	Switch—Automatic brake switch—(S4)	.75
	PICKUP AND ARM ASSEMBLIES	
11731	Armature—Pickup armature	.64
11732	Coil—Pickup coil—(L23)	.60
4543	Damper—Pickup damper block complete with damper plate	.10
12931	Pickup and arm complete	7.50
11951	Screw—Needle holding screw—Package of 10	.46
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board assembly	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11470	Coil—Field coil—(L16)	2.16
11469	Neutralizing coil—(L18)	.20
11258	Cone—Reproducer cone—(L17)—Package of 5	3.85
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9622	Reproducer complete	7.16
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20
	MOTOR ASSEMBLIES	
10194	Ball—Steel ball bearing—Package of 20	.25
11740	Base—Motor base and bearing assembly	1.45
11745	Cap—Turntable spindle cap—Package of 5	.30
11733	Coil—Stator assembly—comprising coil and laminations—105-125 volts, 60-cycle operation	2.96
11734	Coil—Stator assembly—comprising coil and laminations—105-125 volts, 50-cycle operation	3.08
11735	Coil—Stator assembly—comprising coil and laminations—105-125 volts, 25-cycle operation	$3.08
11748	Damper—Motor damper assembly—comprising one damper, one damper plate, one screw, two rubber washers and one "C" washer	.20
11741	Motor—105-125 volts, 60-cycle motor complete—(M1)	11.10
11742	Motor—105-125 volts, 50-cycle motor complete	11.10
11743	Motor—105-125 volts, 25-cycle motor complete	11.60
11746	Tripper—Automatic brake tripper—located on rotor laminations	.16
11737	Turntable—Turntable assembly—complete with rotor laminations—60-cycle operation	4.80
11738	Turntable—Turntable assembly—complete with rotor laminations—50-cycle operation	4.80
11739	Turntable—Turntable assembly—complete with rotor laminations—25-cycle operation	5.05
4083	Washer—Leather washer—Package of 10	.20
4084	Washer—Metal washer—Package of 10	.26
	MISCELLANEOUS ASSEMBLIES	
11762	Box—Used needle box	.25
11996	Bracket—Tuning lamp mounting bracket and clamp	.22
12030	Cable—2-conductor shielded cable, approx. 18 inches long, connects phonograph volume control to compensator pack	.52
12031	Cable—3-conductor shielded cable, approx. 19 inches long, complete with 4-contact female connector, connects phonograph volume to receiver	1.04
11272	Clamp—Cable clamp for phonograph volume control cable, Stock Nos. 12030 and 12031—Package of 5	.10
11760	Compensator—Phonograph compensator pack, comprising one 470-ohm and one 1,000-ohm resistors, one .01 Mfd., one .1 Mfd. and one 1 Mfd. capacitors and one .25 Henry reactor—(L24, C39, C40, C41, R25, R26)	3.85
4153	Connector—4-contact female connector for cable, Stock No. 12031	.48
12666	Cover—Reproducer cover	.65
12698	Escutcheon—Station selector escutcheon and crystal	1.02
12742	Escutcheon—Tuning tube escutcheon	.22
11347	Knob—Phonograph volume control, receiver volume control, or range switch knob—Package of 5	.75
11610	Knob—Station selector knob—includes one large and one small knob—Package of 5	1.00
11582	Knob—Tone and power switch knob—Package of 5	.50
11763	Receptacle—Needle receptacle	.38
11210	Screw—Chassis mounting screw assembly—comprising one screw, one washer, and one lockwasher—Package of 4	.28
4982	Spring—Retaining spring for large knob in Stock No. 11610—Package of 10	.50
11349	Spring—Retaining spring for small knob in Stock Nos. 11610, 11347 and 11582—Package of 5	.25
11695	Volume Control—Phonograph volume control and switch—(R27, S5)	1.60

First Edition.

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 7U2

Seven-Tube, Three-Band, A-C, Radio—Phonograph

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Standard broadcast" (A) .... 540- 1,625 kc
"Medium wave" (B) .... 1,625- 5,700 kc
"Short wave" (C) .... 5,700-18,000 kc

ALIGNMENT FREQUENCIES

"Standard broadcast" (A) ... 600 kc (osc.), 1,400 kc (osc. and ant.)
"Medium wave" (B) ....None required
"Short wave" (C) ...... 15,000 kc (osc. and ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6A8 .... First-detector–oscillator
(2) RCA-6K7 .... Intermediate amplifier
(3) RCA-6H6 .... Second-detector–a.v.c.
(4) RCA-6F5 .... Audio voltage amplifier
(5) RCA-6F6 .... Audio power amplifier
(6) RCA-5Z4 .... Full-wave rectifier
(7) RCA-6G5 .... Tuning tube

Pilot Lamps (5) .... Mazda No. 46, 6.3 volts, 0.25 amperes

POWER SUPPLY RATINGS

		Radio	Total Radio and Phonograph
Rating A-6	105-125 volts, 60 cycles	95 watts	120 watts
Rating A-5	105-125 volts, 50 cycles	95 watts	120 watts
Rating B-2	105-125 volts, 25 cycles	95 watts	120 watts
Rating C-6	105-130/140-160/200-250 volts, 60 cycles	95 watts	120 watts
Rating C-5	105-130/140-160/200-250 volts, 50 cycles	95 watts	120 watts

POWER OUTPUT

Undistorted .... 2.0 watts
Maximum .... 4.5 watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (v.c.) .... 2.2 ohms at 400 cycles

PHONOGRAPH

Type .... Manual
Turntable Speed .... 78 r.p.m.
Type of Pickup .... High-impedance magnetic
Pickup Impedance ...... 1,400 ohms at 1,000 cycles

Mechanical Specifications

Height .... 42 inches
Width .... 25¼ inches
Depth .... 15¼ inches
Weight (net) .... 77 pounds
Weight (shipping .... 113 pounds
Chassis Base Dimensions .... 12 inches x 7 inches x 2½ inches
Over-all Chassis Height .... 8 inches
Operating Controls. (1) Power switch–Tone, (2) Tuning, (3) Volume, (4) Range selector, (5) Radio–Phono-volume
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Description

The Model 7U2 combination instrument consists of a seven-tube radio receiver and a manually-operated phonograph combined in one cabinet. The superheterodyne circuit is used with such features of design as antenna wave-trap, magnetite-core adjusted i-f transformers, aural compensated volume control, continuously variable tone control with music-voice switch, automatic volume control, resistance-coupled audio system, tuning tube "Magic Eye," and band selective indication of dial scales.

The circuit arrangement consists of a combined first-detector—oscillator stage, an i-f amplifier stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, an audio power-output stage, a tuning indicator "Magic Eye" and a full-wave rectifier. Additional information may be obtained concerning the functions of the various circuits by referring to "Circuit Arrangement" in "Technical Information and Service Data" for Model 7U, noting that molded magnetite-core tuned i-f transformers are used in Model 7U2. The tuning tube consists of an RCA-6G5. The phonograph motor is of the governor induction type.

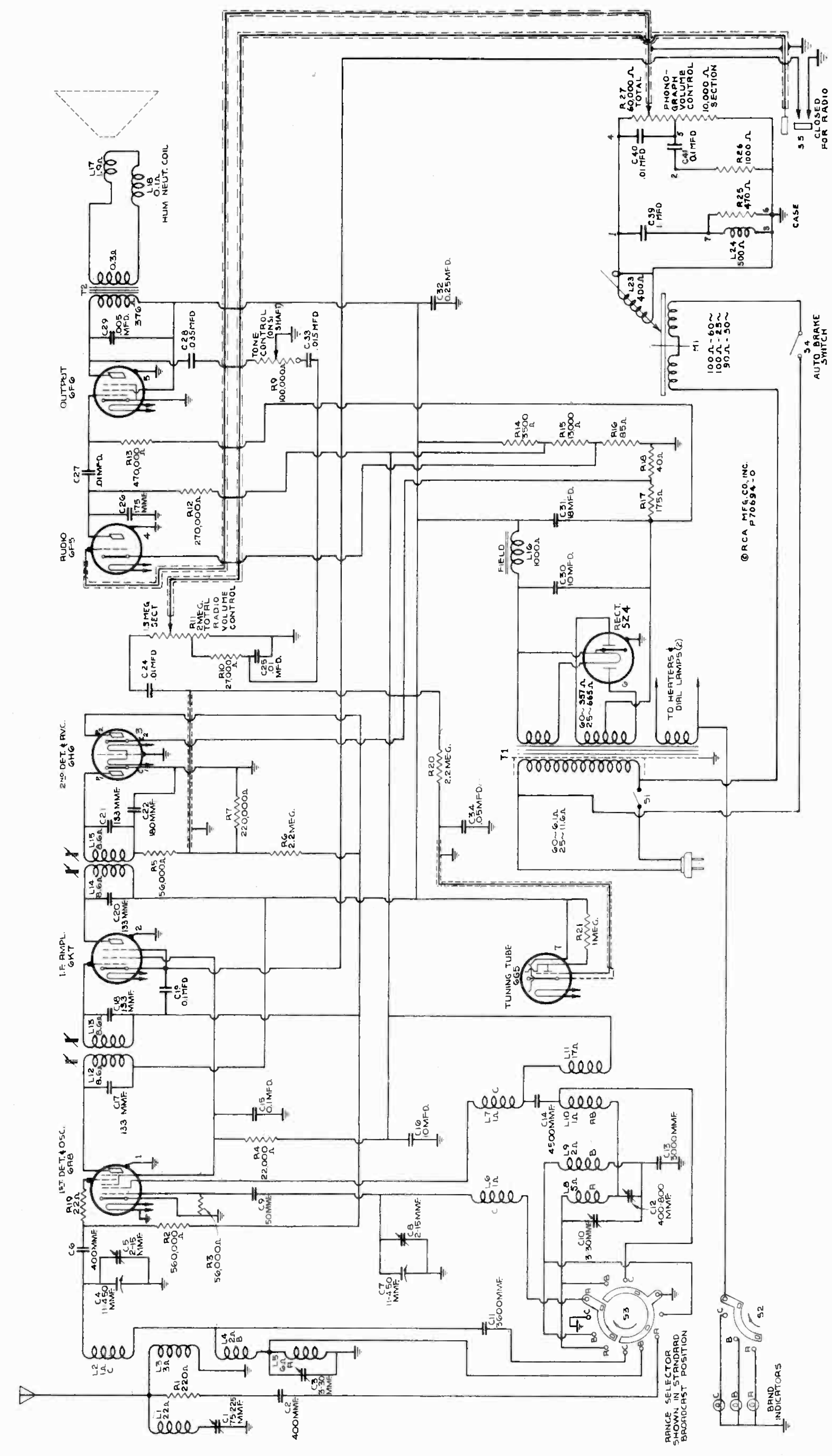


Figure 1—Schematic Circuit Diagram

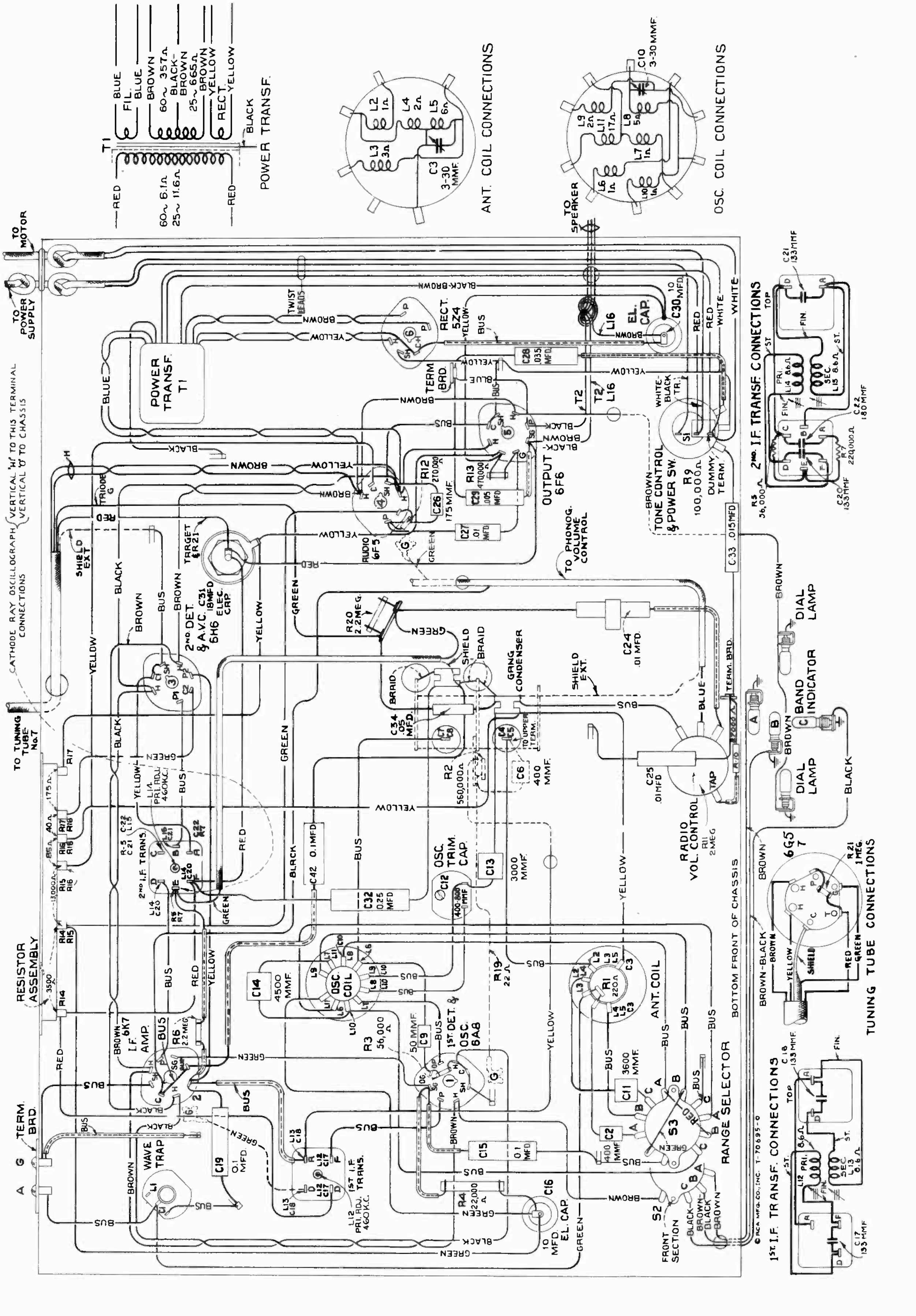


Figure 2—Chassis Wiring Diagram

SERVICE DATA

Alignment

The r-f and i-f adjustments on this instrument should be performed as outlined under "Alignment" in "Technical Information and Service Data" for Model 7U, substituting the magnetite-core symbols L15, L14, L13 and L12 for the trimming capacitor symbols C21, C20, C18 and C17 respectively in "I-F Adjustments."

Phonograph

The phonograph motor is of the governor induction type and is designed to be simple and foolproof. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in Figures 4 and 5. Application of oil to the felt pad which rubs against the governor disc will insure smooth operation.

Pickup adjustments are the same as outlined for Model 7U.

Resistance and Voltage Measurements

Voltage and resistance measurements for this receiver are the same as for Model 7U (Figures 4 and 7), with the following exception:

The resistance value shown on Figure 4, between the plate and capacitor C31 terminals of the RCA-6A8 first-detector and oscillator, and the RCA-6K7 i-f amplifier, should be 8.6 ohms instead of 13 ohms.

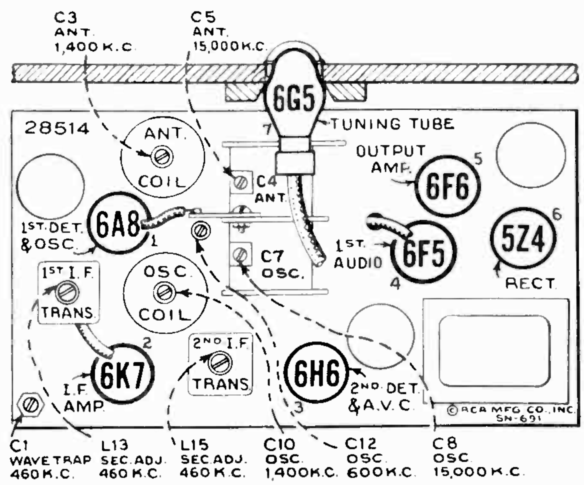


Figure 3—Radiotron, Coil, and Trimmer Locations

SERVICE HINT

Hum or rumble during phonograph operation may be corrected by re-mounting the motor solid to motor board using Stock No. 13573 mounting parts.

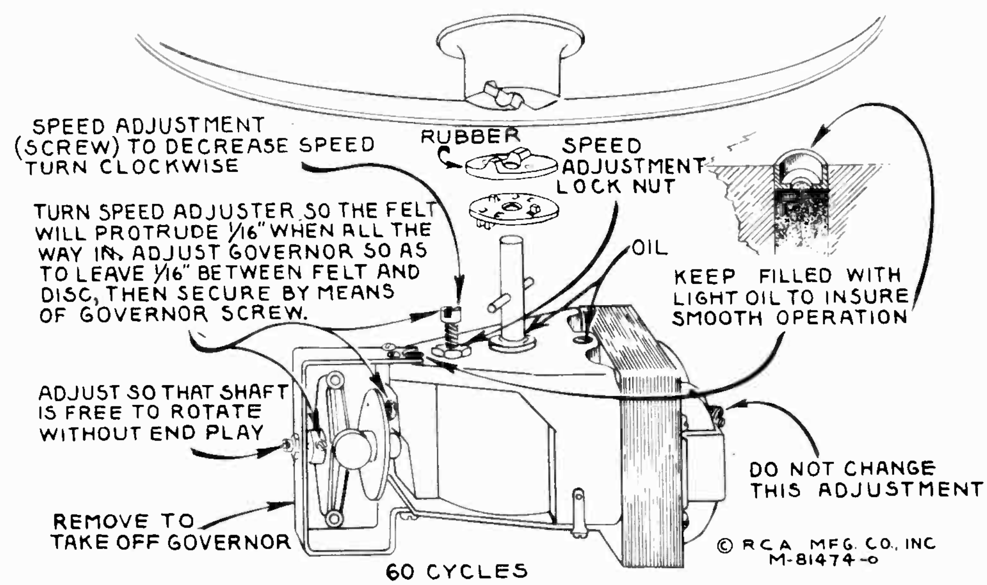


Figure 4—Details of 60-Cycle Motor

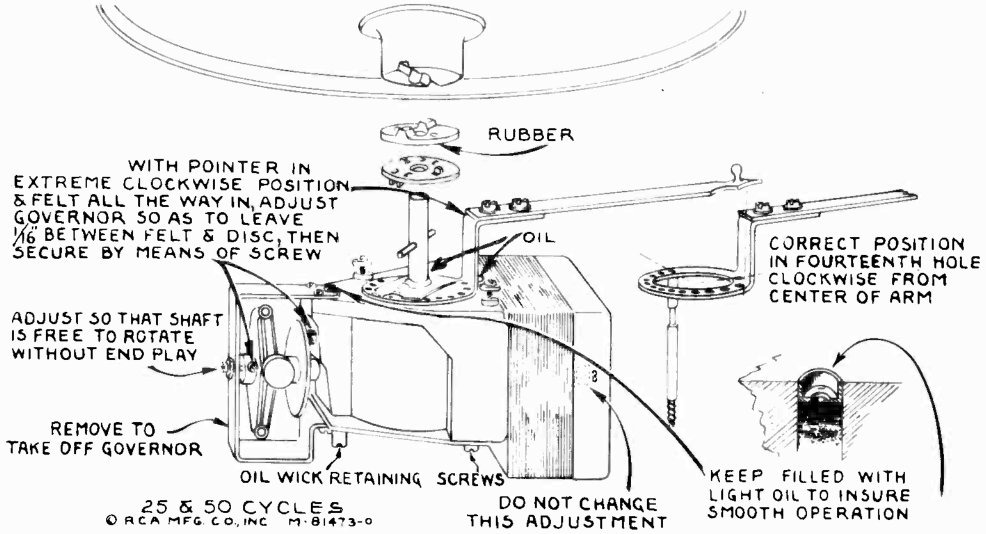


Figure 5—Details of 25- or 50-Cycle Motor

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12930	Board—Antenna and ground terminal board	$0.20
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11888	Cable—Tuning lamp cable and socket	1.06
12032	Cable—3-conductor, shielded, volume control cable, approx. 8 inches long, complete with 4-contact male connector and grid contact cap	.90
11350	Cap—Grid contact cap—Package of 5	.20
12511	Cap—Grid contact cap—Package of 5	.15
11289	Capacitor—50 Mmfd. (C9)	.26
12946	Capacitor—133 Mmfd. (C17, C18, C20, C21)	.20
11623	Capacitor—175 Mmfd. (C26)	.18
12406	Capacitor—180 Mmfd. (C22)	.26
11290	Capacitor—400 Mmfd. (C2. C6)	.25
11622	Capacitor—3,000 Mmfd. (C13)	.36
11621	Capacitor—3,600 Mmfd. (C11)	.38
11287	Capacitor—4,500 Mmfd. (C14)	.30
4868	Capacitor—.005 Mfd. (C29)	.20
11315	Capacitor—0.15 Mfd. (C33)	.20
12670	Capacitor—.035 Mfd. (C28)	.20
11395	Capacitor—.01 Mfd. (C24)	.18
4858	Capacitor—.01 Mfd. (C25, C27)	.25
4836	Capacitor—.05 Mfd. (C34)	.30
11414	Capacitor—0.1 Mfd. (C15, C42)	.20
4841	Capacitor—0.1 Mfd. (C19)	.22
5170	Capacitor—.25 Mfd. (C32)	.25
11240	Capacitor—10 Mfd. (C30)	1.08
11387	Capacitor—10 Mfd. (C16)	.86
5212	Capacitor—18 Mfd. (C31)	1.16
11465	Capacitor—Adjustable trimmer (C12)	.48
11256	Capacitor—Adjustable trimmer for wave-trap, Stock No. 11391 (C1)	.48
11617	Coil—Antenna coil less shield (L2, L3, L4, L5, C3, R1)	1.68
11618	Coil—Oscillator coil less shield (L6, L7, L8, L9, L10. L11, C10)	2.22
13597	Condenser—2-gang variable tuning condenser (C4, C5, C7, C8)	4.55
4573	Connector—2-contact female connector for motor cable, receiver section	$0.30
5119	Connector—3-contact female connector for chassis reproducer cable	.25
6123	Connector—4-contact male connector for cable, Stock No. 12032	.30
12006	Core—Adjustable core and stud for Stock No. 13106 and No. 13107	.22
13598	Drive—Variable tuning condenser vernier drive	.80
13599	Foot—Chassis mounting foot and bracket assembly—Package of 2	.55
12770	Holder—Dial scale holder and lamp bracket assembly	.55
12712	Indicator—Station selector indicator pointer	.22
4340	Lamp—Dial lamp—Package of 5	.60
12718	Mask—Dial light diffuser complete with red, orange and green-colored screen	.40
11466	Resistor—Voltage divider, comprising one 3,500-ohm, one 13,000-ohm, one 85-ohm, one 40-ohm and one 175-ohm sections (R14, R15, R16. R17, R18)	.95
11624	Resistor—22 ohms, flexible type complete with grid contact cap (R19)	.22
11620	Resistor—220 ohms, carbon type, 1/10 watt—Package of 5 (R1)	.75
8070	Resistor—22,000 ohms, carbon type, ½ watt—Package of 5 (R4)	1.00
11400	Resistor—27,000 ohms, carbon type, ¼ watt—Package of 5 (R10)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R5)	.75
12286	Resistor—56,000 ohms. insulated, ¼ watt—Package of 5 (R3)	1.00
11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R7)	.75
11453	Resistor—270,000 ohms, carbon type, 1/10 watt—Package of 5 (R12)	.75
11452	Resistor—470,000 ohms, carbon type, 1/10 watt—Package of 5 (R13)	.75
11397	Resistor—560,000 ohms, carbon type, 1/10 watt—Package of 5 (R2)	.75
12013	Resistor—1 megohm, carbon type, 1/10 watt—Package of 5 (R21)	.75

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
11626	Resistor—2.2 megohms, carbon type, ¼ watt—Package of 5 (R6, R20)	$1.00
12607	Shield—First I. F. transformer shield top	.30
12581	Shield—Second I. F. transformer shield top	.36
11603	Shield—Coil shield for Stock Nos. 11617 and 11618	.26
12735	Shield—Dial lamp shield—Package of 5	.25
12008	Shield—I. F. transformer shield for Stock Nos. 13106 and 13107	.28
11199	Socket—Dial lamp socket	.14
12771	Socket—Dial lamp socket, located at top of dial scale	.25
11381	Socket—Tuning lamp socket and cover	.45
11195	Socket—5-contact 5Z4 Radiotron socket	.15
11198	Socket—7-contact 6F5 or 6H6 Radiotron socket	.15
11196	Socket—8-contact 6A8, 6F6 or 6K7 Radiotron socket	.15
12007	Spring—Retaining spring for core, Stock No. 12006—Package of 10	.36
12769	Switch—Range switch (S2, S3)	1.25
12668	Tone control and power switch (R9, S1)	1.22
11391	Trap—Wave-trap (L1, C1)	1.22
13106	Transformer—First I. F. transformer (L12, L13, C17, C18)	1.60
13107	Transformer—Second I. F. transformer (L14, L15, C20, C21, C22, R5, R7)	2.06
11848	Transformer—Power transformer, 100-125 volts, 50-60 cycles (T1)	4.40
11849	Transformer—Power transformer, 100-125 volts, 25-40 cycles (T1)	5.70
11850	Transformer—Power transformer, 105-250 volts, 40-60 cycles (T1)	8.00
13144	Volume control (R11)	1.00
	MOTOR BOARD ASSEMBLIES	
4577	Connector—2-contact male connector for motor leads	.30
13575	Escutcheon—Motor speed regulator escutcheon for 25- or 50-cycle motors only	.25
13065	Lever—Brake mechanism actuating lever, fastens to pivot shaft under base	.20
3261	Rest—Pickup rubber rest—Package of 5	.40
13573	Screw—Motor mounting screw assembly, for 60-cycle motor only—Package of 3	.85
13574	Screw—Motor mounting screw assembly, for 25- or 50-cycle motors only—Package of 3	.85
11750	Screw—No. 4-40 x 9/32, cone pointed, headless set screw for lever, Stock No. 13065—Package of 10	.22
	AUTOMATIC BRAKE AND SWITCH ASSEMBLIES	
13582	Brake—Automatic brake and switch complete	2.65
4577	Connector—2-contact male connector for brake switch power supply leads	.30
3994	Cover—Switch cover and screw	.26
10174	Springs—Complete set of springs for automatic brake—Package of 2 sets	.50
3322	Switch—Automatic brake switch (S4)	.75
	PICKUP AND ARM ASSEMBLIES	
11731	Armature—Pickup armature	.64
11732	Coil—Pickup coil (L23)	.60
4543	Damper—Pickup damper block complete with damper plate	.10
13579	Pickup and arm complete	7.85
11951	Screw—Needle holding screw—Package of 10	.46

Stock No.	DESCRIPTION	List Price
	REPRODUCER ASSEMBLIES	
12641	Board—Terminal board assembly	$0.15
12640	Bracket—Output transformer mounting bracket	.18
13600	Coil—Field coil (L16)	1.75
11469	Neutralizing coil (L18)	.20
12667	Cone—Reproducer cone (L17)	1.00
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9766	Reproducer complete	7.25
11253	Transformer—Output transformer (T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20
	MOTOR ASSEMBLIES	
13576	Motor—105-125 volts, 60-cycle motor complete (M1)	18.90
13577	Motor—105-125 volts, 50-cycle motor complete	25.20
13578	Motor—105-125 volts, 25-cycle motor complete	25.20
13583	Regulator—Motor speed regulator pointer, used on 25- and 50-cycle motors only	.25
	MISCELLANEOUS ASSEMBLIES	
11762	Box—Used needle box	.25
11996	Bracket—Tuning lamp mounting bracket and clamp	.22
12030	Cable—2-conductor shielded cable, approx. 18 inches long, connects phonograph volume control to compensator pack	.52
12031	Cable—3-conductor shielded cable, approx. 19 inches long, complete with 4-contact female connector, connects phonograph volume to receiver	1.04
11272	Clamp—Cable clamp for phonograph volume control cable, Stock Nos. 12030 and 12031—Package of 5	.10
11760	Compensator—Phonograph compensator pack, comprising one 470-ohm and one 1,000-ohm resistors, one .01 Mfd., one .1 Mfd. and one 1 Mfd. capacitors and one .25 Henry reactor, L24, C39, C40, C41, R25, R26)	3.85
4153	Connector—4-contact female connector for cable, Stock No. 12031	.48
12666	Cover—Reproducer cover	.65
12698	Escutcheon—Station selector escutcheon and crystal	1.02
12742	Escutcheon—Tuning tube escutcheon	.22
11347	Knob—Phonograph volume control, receiver volume control, or range switch knob—Package of 5	.75
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11582	Knob—Tone and power switch knob—Package of 5	.50
11763	Receptacle—Needle receptacle	.38
11210	Screw—Chassis mounting screw assembly, comprising one screw, one washer, and one lockwasher—Package of 4	.28
4982	Spring—Retaining spring for large knob in Stock No. 12699—Package of 10	.50
11349	Spring—Retaining spring for small knob in Stock Nos. 12699, 11347 anl 11582—Package of 5	.25
11696	Turntable—Complete	2.48
11695	Volume control—Phonograph volume control and switch (R27, S5)	1.60

First Edition.

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 7X

Seven-Tube, Three-Band, AC-DC, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges	
"Standard Broadcast" (A)	530-1,780 kc.
"Medium Wave" (B)	1,780-6,300 kc.
"Short Wave" (C)	6,300-22,000 kc.

Alignment Frequencies	
"Standard Broadcast" (A)	600 kc. (osc.), 1,500 kc. (osc., ant.)
"Medium Wave" (B)	6,000 kc. (osc., ant.)
"Short Wave" (C)	20,000 kc. (osc., ant.)

Intermediate Frequency .... 460 kc.

Radiotron Complement	
(1) RCA-6L7	First Detector (Converter)
(2) RCA-6J7	Oscillator
(3) RCA-6K7	Intermediate Amplifier
(4) RCA-6H6	Second Detector-A.V.C.
(5) RCA-6J7	Audio Voltage Amplifier
(6) RCA-25A6	Audio Power Amplifier
(7) RCA-25Z6	Half-Wave Rectifier

Pilot Lights (3) .... Mazda No. 40, 6.3 volts, 0.15 ampere

Power Supply Ratings	
D. C. Rating	105-125 volts, 45 watts
A. C. Rating	105-125 volts, 25-100 cycles, 50 watts

Power Output	(125 volt, A. C. line)
Undistorted	0.6 watt
Maximum	1.5 watts

Power Output	(125 volt, D. C. line)
Undistorted	0.5 watt
Maximum	1.2 watts

Loudspeaker (Permanent-Magnet Dynamic) .... Impedance (V. C.) 2.25 ohms at 400 cycles

Mechanical Specifications

Height	$20\frac{1}{4}$ inches
Width	$14\frac{7}{8}$ inches
Depth	$9\frac{3}{16}$ inches
Weight (Net)	27 pounds
Weight (Shipping)	34 pounds
Chassis Base Dimensions	12 inches x 7 inches x $2\frac{1}{2}$ inches
Over-all Height of Chassis	8 inches
Tuning Drive Ratios	10 to 1 and 50 to 1
Operating Controls	(1) Volume, (2) Tuning, (3) Range Selector, (4) Tone–Power Switch

General Features

This receiver consists of a seven-tube chassis mounted in a table-type cabinet. The superheterodyne type of circuit is used, with such features of design as: automatic volume control, diode detection, magnetite core adjusted i-f transformers, and wave-trap, band-selective illumination of full vision dial scales, dual-ratio tuning, resistance-coupled audio system, phonograph terminal board, and a permanent-magnet dynamic loudspeaker. The tuning range is continuous through the "Standard broadcast," Medium wave," and "Short wave" bands.

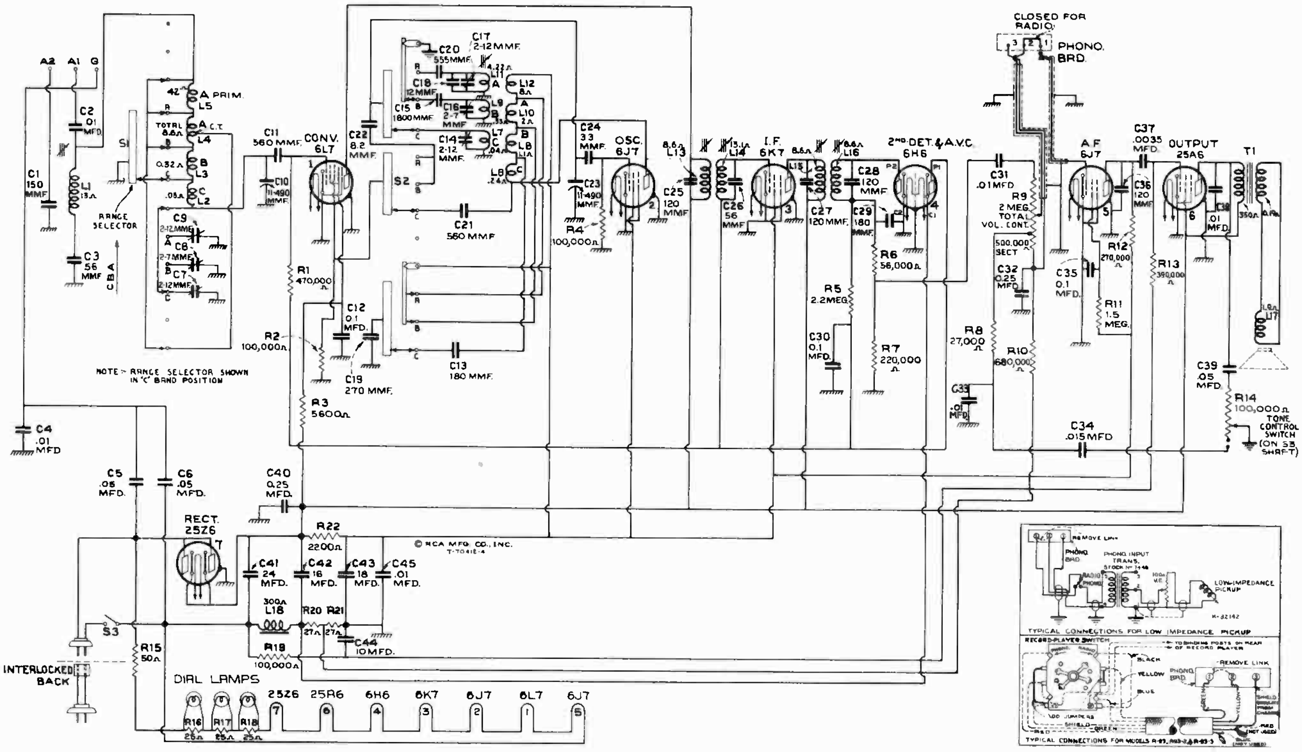


Figure 1—Schematic Circuit Diagram

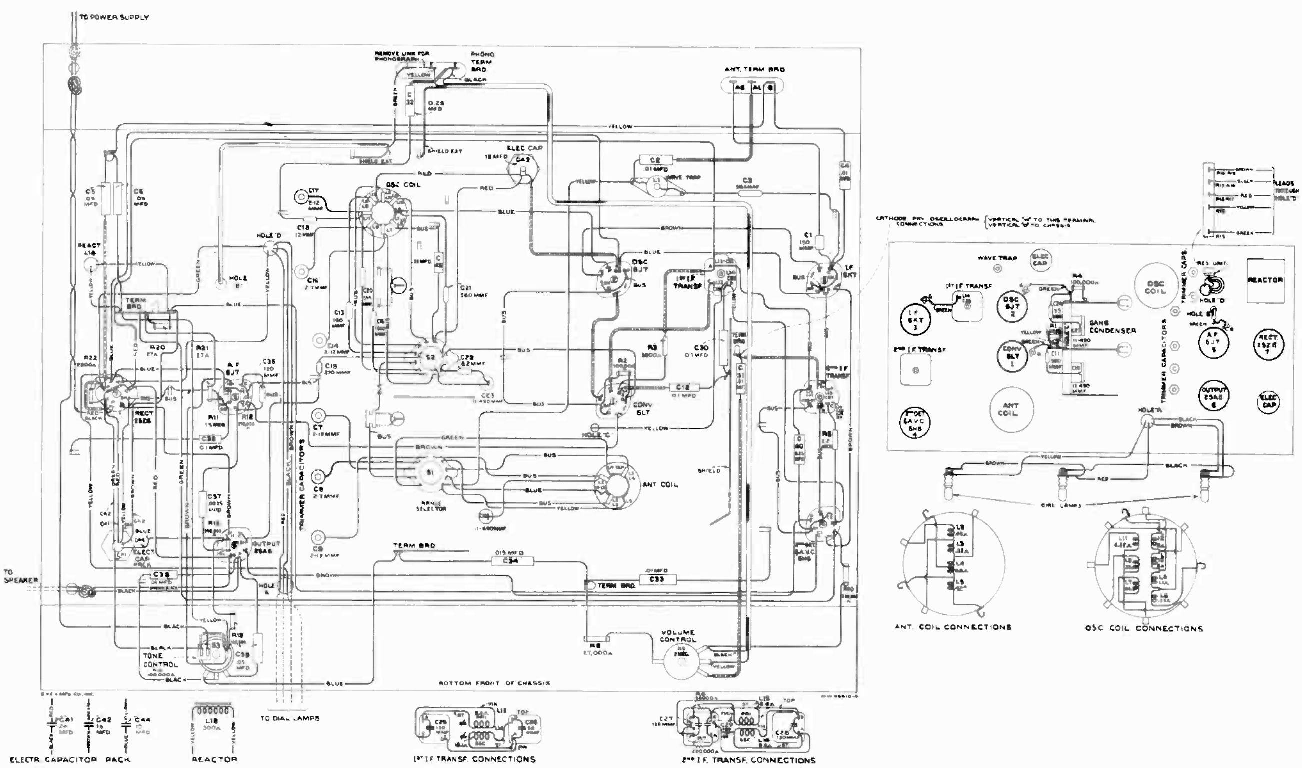


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of a first-detector (converter) stage, separate oscillator stage, a single i-f stage, a diode-detector — automatic-volume-control stage, an audio voltage-amplifier stage, a pentode power-output stage, and a half-wave rectifier stage.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to control grid No. 1 of the RCA-6L7 through a tuned r-f transformer. This transformer is tapped so that the range selector increases the range of tuning by decreasing the amount of inductance. Separate windings are employed in the oscillator stage for each position of the range selector. Air-dielectric trimming capacitors are used for obtaining exact alignment. Proper low-frequency tracking of the oscillator for "Standard broadcast" is accomplished by adjusting the inductance of the respective coil with a molded magnetite core.

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc.

The modulated signal, as obtained from the output of the i-f stage, is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R6 and R7, is applied, as automatic control-grid bias to the first-detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal.

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio voltage-amplifier tube. Phonograph terminals are inserted at this point for feeding the output of an external phonograph pickup to the control grid of the audio amplifier. Resistance-capacitance coupling is used between the first-audio stage and the power-output stage. The power-output stage is transformer-coupled to the permanent-magnet dynamic loudspeaker. Continuously-variable tone control is effected by means of capacitor C39 and variable resistor R14 shunting the plate circuit of the output tube. Extreme clockwise rotation of this tone control disconnects the resistor R14 from the circuit and places an additional capacitor C34 in shunt with capacitor C33, thereby reducing the low-frequency response of the amplifier. This point is known as the "Speech" position and provides optimum intelligibility of speech.

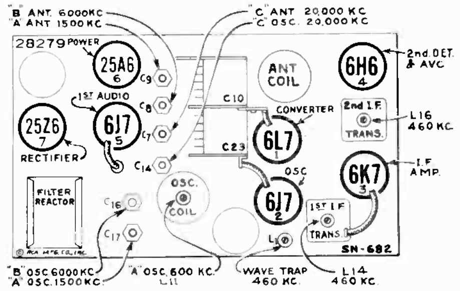


Figure 3—Radiotron, Coil, and Trimmer Locations

SERVICE DATA

Alignment Procedure

The low-frequency oscillator tracking (600 kc.), wave-trap, and i-f transformer adjustments are made by means of six screws attached to molded magnetite cores. The remaining adjustments in the antenna and oscillator circuits are made with six plunger-type air-dielectric trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Before adjusting the plunger-type trimmers, they must be unlocked by loosening their hexagon lock nuts. The lock nuts should be tightened upon completion of adjustments. For location of these adjustments refer to figures 3 and 5.

A standard test oscillator, such as the **RCA Stock No. 9595,** will be required as a source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to show when the correct point of adjustment is reached. The **RCA Stock No. 4317 Neon Glow Indicator** is designed for this purpose.

Attach the output indicator across the loudspeaker voice coil. Advance the receiver volume control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output control so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a strong signal.

I-F Adjustments

Connect the "Ant." output of the test-oscillator to the grid cap of the RCA-6L7 through a **.001 mfd.** capacitor. Connect the test oscillator "Gnd." terminal to the ground terminal of the receiver chassis. Place the receiver range selector in its "Standard broadcast" (A) position and set receiver dial pointer to a position of no extraneous signals **near 600 kc.** Ground stator of local oscillator tuning condenser C23 to eliminate local oscillator signals. Adjust the test oscillator to **460 kc.**

Adjust the two magnetite core screws **L16** and **L15** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then adjust the two magnetite core screws **L14** and **L13** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments. Remove temporary chassis ground from oscillator stator C23.

R-F Adjustments

Calibrate the tuning dial by adjusting the scale pointer to the extreme low-frequency end calibration mark **(530 kc.)** on "Standard broadcast" scale while the gang tuning condenser plates are in their full-mesh position. Alignment should be made in sequence of "Wave-trap," "Short wave," "Medium wave," and "Standard broadcast."

Wave-Trap Adjustment

Attach the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a **200-mmfd. (important)** capacitor. The ground connections remain connected together. Leave the test oscillator adjusted to **460 kc.** and range selector in "Standard broadcast" position as before. Then adjust the wave-trap screw **L1** to the point which causes maximum suppression (minimum indicated output) of the **460 kc.** signal.

"Short Wave" Band

Connect the "Ant." output of the test oscillator to the receiver antenna terminal "A1" through a **300-ohm** resistor, leaving the ground connections as before. Place the receiver range selector to its "Short wave" (C) position and set the dial pointer to **20,000 kc.** Adjust test oscillator to **20,000 kc.** Adjust the oscillator trimmer **C14** to produce maximum (peak) output. Two positions of this trimmer may be found which produce maximum output. The position of minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the antenna trimmer **C7** to produce maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two positions may be found on this trimmer which produce maximum output. The position of maximum capacitance (plunger near in) should be used. Tighten lock nut. Check for image signal by changing the receiver dial setting to **19,080 kc.** If the oscillator trimmer **C14** has been correctly adjusted, the image signal will be received at this position. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

Connections for test oscillator remain the same as for "Short Wave" (C) Band. Adjust the test oscillator to **6,000 kc.** Place receiver range selector to "Medium Wave" (B) position and set receiver dial pointer to **6,000 kc.** Then adjust the two trimmers **C16** and **C8** of the oscillator and antenna coils so that each produces maximum (peak) indicated receiver output. Tighten trimmer lock nuts.

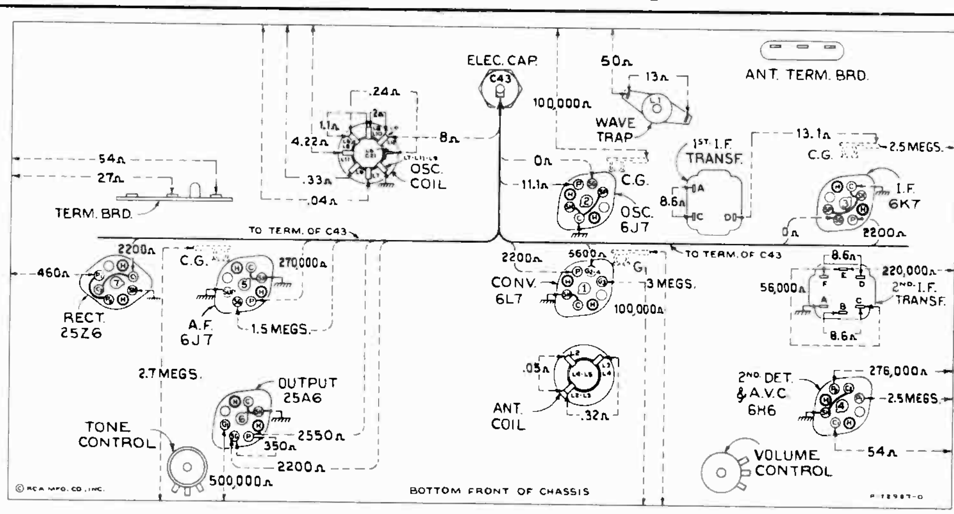


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Tone control optional—Volume control maximum

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

"Standard Broadcast" Band

Change test oscillator connections by substituting **200 mmfd.** condenser for the 300-ohm resistor. Adjust test oscillator and set receiver dial pointer to **1,500 kc.** Place receiver range selector to "Standard broadcast" (A) position.

Then adjust the two trimmers, **C17** and **C9**, of the oscillator and antenna coils so that each produces maximum (peak) receiver output. Shift the test oscillator frequency to **600 kc.** Tune the receiver to pick up this signal **near 600 kc.,** disregarding the dial reading at which it is best received. Then adjust the oscillator magnetite core screw **L11** simultaneously rocking the receiver tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustments at **1,500 kc.** should then be repeated to correct for any change which may have been caused by the **600 kc.** oscillator adjustment. Tighten lock nuts on **C17** and **C9.**

Miscellaneous

Antenna and Ground Terminals.—The ground terminal "G" shall always be connected to a good external ground. Connect transmission-line leads of the RCA-RK40A antenna system to terminals "A2" and "A." Connect the receiver coupling units of the RCA-RK40 and the RCA Spider-web antenna systems to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Phonograph Terminal Board.—Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on Schematic Diagram (figure 1).

Loudspeaker.—Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals Under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6L7—Converter	7.5	ma.
(2)	RCA-6J7—Osc.	3.5	ma.
(3)	RCA-6K7—I. F. Amp.	8.5	ma.
(4)	RCA-6H6—2nd Det.-A.V.C.	—	
(5)	RCA-6J7—Audio	0.22	ma.
(6)	RCA-25A6—Power	27.0	ma.
(7)	RCA-25Z6—Rectifier	48.0	ma.

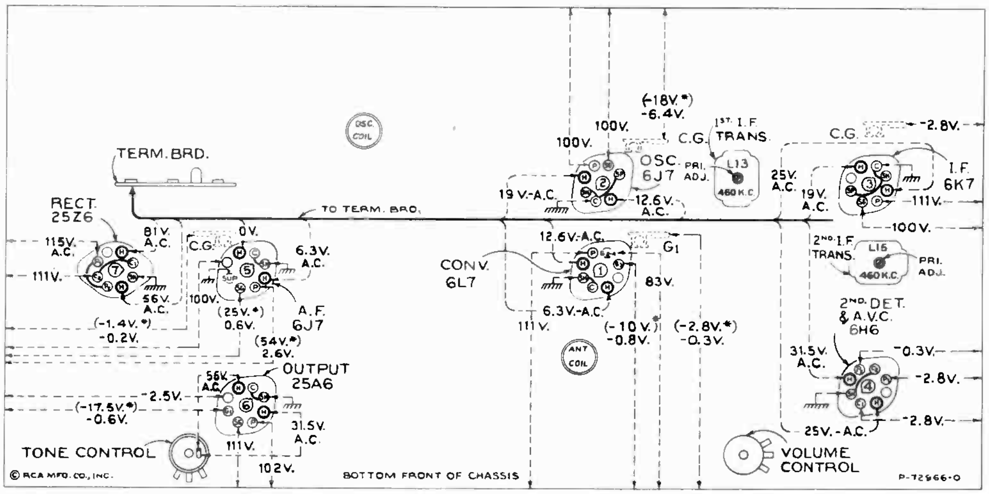


Figure 5—Radiotron Socket Voltages and Trimmer Locations

Measured at 115 volts, 60-cycle supply—For 115-volt d-c supply approximately 10% lower—Tuned to approximately 1,000 kc—No signal being received—Tone control optional—Volume control maximum

Radiotron Socket Voltages

Note: *Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 5 will assist in locating cause of faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

REPLACEMENT PARTS

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

RECEIVER ASSEMBLIES

Stock No.	DESCRIPTION	List Price
12716	Board—Antenna and ground terminal board	$0.20
12717	Board—Phonograph terminal board	.22
5237	Bushing—Tuning condenser mounting bushing assembly—Package of 3	.43
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer (C7, C9, C16, C17)	.38
12807	Capacitor—Adjustable trimmer (C8, C14)	.35
13001	Capacitor—8.2 Mmfd. (C22)	.20
13002	Capacitor—12 Mmfd. (C18)	.20
12948	Capacitor—33 Mmfd. (C24)	.20
12723	Capacitor—56 Mmfd. (C3)	.20
12629	Capacitor—56 Mmfd. (C26)	.20
12404	Capacitor—120 Mmfd. (C25, C27, C28)	.26
12724	Capacitor—120 Mmfd. (C36)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12406	Capacitor—180 Mmfd. (C29)	.26
13003	Capacitor—180 Mmfd. (C13)	.20
12488	Capacitor—270 Mmfd. (C19)	.20
12537	Capacitor—560 Mmfd. (C11, C21)	.20
12727	Capacitor—555 Mmfd. (C20)	.20
12947	Capacitor—1,800 Mmfd. (C15)	.40
5005	Capacitor—.0035 Mfd. (C37)	.16
11315	Capacitor—.015 Mfd. (C34)	.20
4886	Capacitor—.05 Mfd. (C5, C6, C39)	.20
4841	Capacitor—0.1 Mfd. (C12, C30, C35)	.22
4858	Capacitor—.01 Mfd. (C2, C4, C31, C33, C38, C45)	.25
5170	Capacitor—0.25 Mfd. (C32)	.25
4840	Capacitor—0.25 Mfd. (C40)	.30
5212	Capacitor—18 Mfd. (C43)	1.16
12998	Capacitor—Pack comprising one 24 Mfd., one 16 Mfd. and on 10 Mfd. sections (C41, C42, C44)	3.70
12708	Coil—Antenna coil and shield (L2, L3, L4, L5)	2.04
12943	Coil—Oscillator coil and shield (L6, L7, L8, L9, L10, L11, L12)	2.30
12701	Condenser—2-gang variable tuning condenser (C10, C23)	4.00
11979	Connector—2-contact male connector for power leads	.30
5119	Connector—3-contact female connector for speaker leads	.25
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12006	Core—Adjustable core and stud for Stock No. 12801 and No. 12653	.22
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12996	Dial—Station selector dial scale	.80
12702	Drive—Vernier drive for tuning condenser	.68
12712	Indicator—Station selector indicator pointer	.22
4340	Lamp—Dial lamp—Package of 5	.60
12718	Mask—Dial light diffuser complete with colored screen	.40
12997	Range switch—(S1, S2)	2.05
12999	Reactor—Filter reactor (L18)	1.60
11955	Resistor—27 ohms, carbon type, ¼ watt —Package of 5 (R21)	1.00
12453	Resistor—27 ohms, insulated, ¼ watt—Package of 5 (R20)	1.00
13004	Resistor—2,200 ohms, carbon type, ½ watt—Package of 5 (R22)	1.00
11647	Resistor—5,600 ohms, carbon type, ¼ watt—Package of 5 (R3)	1.00
11400	Resistor—27,000 ohms, carbon type, ¼ watt—Package of 5 (R3)	1.00
11282	Resistor—56,000 ohms, carbon type, 1/10 watt—Package of 5 (R6)	.75
11281	Resistor—100,000 ohms, carbon type, 1/10 watt—Package of 5 (R4)	.75
5145	Resistor—100,000 ohms. carbon type, ¼ watt—Package of 5 (R2, R19)	1.00
11398	Resistor—220,000 ohms, carbon type, 1/10 watt—Package of 5 (R7)	$0.75
11453	Resistor—270,000 ohms, carbon type, 1/10 watt—Package of 5 (R12)	.75
13005	Resistor—390,000 ohms, carbon type, 1/10 watt—Package of 5 (R13)	.75
11452	Resistor—470,000 ohms, carbon type, 1/10 watt—Package of 5 (R1)	.75
11811	Resistor—680,000 ohms, carbon type, ¼ watt—Package of 5 (R10)	1.00
4241	Resistor—1.5 meg., carbon type, ¼ watt —Package of 5 (R11)	1.00
12651	Shield—Coil shield for Stock No. 12708	.22
12710	Shield—Coil shield for Stock No. 12709	.28
12607	Shield—1st I. F. transformer shield cap	.30
12008	Shield—I. F. transformer shield for Stock Nos. 12801, 12653	.28
12581	Shield—2nd I. F. transformer shield cap	.36
12110	Shield—Top cap shield for 6J7 Radiotron	.14
12704	Shutter—Dial scale holder and shutter assembly	.88
11198	Socket—7-contact 6J7, 6K7 or 6L7 Radiotron socket	.15
11196	Socket—8-contact 25A6, 25Z6, 6H6 or 6J7 Radiotron socket	.15
3529	Socket—Dial lamp socket	.32
12007	Spring—Retaining spring for Stock Nos. 12800, 12006 and 12664—Package of 10	.36
12849	Spring—Tension spring for band indicator shutter link—Package of 5	.18
12668	Tone control and power switch (R14, S3)	1.22
12801	Transformer—First I. F. transformer complete (L13. L14, C25, C26)	1.70
12653	Transformer—Second I. F. transformer complete (L15, L16, C27, C28, C29, R6, R7)	2.06
12654	Trap—Wave trap complete (L1)	.75
13144	Volume control (R9)	1.00

REPRODUCER ASSEMBLIES

Stock No.	DESCRIPTION	List Price
12914	Board—2-contact reproducer terminal board	.25
12640	Bracket—Output transformer mounting bracket	.18
12642	Cone—Reproducer cone and dust cap (L17)	.94
5118	Connector—3-contact male connector for speaker leads	.25
9717	Reproducer complete	16.20
11828	Transformer—Output transformer (T1)	1.46

MISCELLANEOUS ASSEMBLIES

Stock No.	DESCRIPTION	List Price
11824	Connector—2-contact female connector for power cord, Stock No. 11823	.34
11823	Cord—Power cord complete	.65
12698	Crystal—Station selector escutcheon and crystal	1.02
12699	Knob—Large station selector knob—Package of 5	.68
12992	Knob—Small vernier station selector knob—Package of 5	.45
12995	Knob—Tone and power switch knob—Package of 5	.45
12994	Knob—Volume control or range switch knob—Package of 5	.45
11377	Screw—Chassis mounting screw assembly—Package of 4	.12
12993	Screw—8-32 x ⅜ headless set screw for knob, Stock Nos. 12992, 12993, 12994 and 12995—Package of 10	.20
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
12679	Resistor—2.2 meg., insulated, ¼ watt—Package of 5 (R5)	1.00
13000	Resistor—Ballast resistor, comprising one 50-ohm and three 40-ohm sections (R15, R16, R17, R18)	1.40
4669	Screw—8-32 set screw for Stock No. 12704—Package of 10	.25

First Edition.

Prices quoted above are subject to change without notice.

RCA VICTOR MODELS 8BT, 8BK, 8BT6, and 8BK6

Eight-Tube, Three-Band, Battery-Operated, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Standard Broadcast" (A) .... 530-1,780 kc
"Medium Wave" (B) .... 1,780-6,300 kc
"Short Wave" (C) .... 6,300-22,000 kc

ALIGNMENT FREQUENCIES
"Standard Broadcast" (A) .... 600 kc (osc.), 1,500 kc (osc., ant.)
"Medium Wave" (B) .... 6,000 kc (osc., ant.)
"Short Wave" (C) .... 20,000 kc (osc., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-1A6 .... First Detector
(2) RCA-1B4 .... Heterodyne Oscillator
(3) RCA-1A4 .... First Intermediate Amplifier
(4) RCA-1A4 ...... Second Intermediate Amplifier
(5) RCA-1F6 ..... Second Detector—A.F.—A.V.C.
(6) RCA-30 .... Audio Driver
(7) RCA-49 .... Power Output
(8) RCA-49 .... Power Output

Pilot Lamps ..... 8BT or 8BK (1); 8BT6 or 8BK6 (2); **2.0 volts, .06 ampere,** miniature screw base, T-3¼ clear

BATTERIES REQUIRED
8BT or 8BK .... "A," one plug-in 2½-volt Air-cell (Eveready A-600 or equivalent), or one 2-volt storage battery; "B," three 45-volt, heavy duty, plug-in type B batteries; "C," one 7½-volt C battery tapped at –3 volts; and four bias cells (Stock No. 12681).
8BT6 or 8BK6 ...... "A," one 6-volt storage battery; "B," none required; "C," one 7½-volt C battery tapped at –3 volts; and four bias cells (Stock No. 12681).

CURRENT CONSUMPTION	8BT or 8BK	8BT6 or 8BK6
"A" at 2 volts	0.58 amp. (pilot lamp off)	
"A" at 2 volts	0.64 amp. (pilot lamp on)	
"A" at 6.0 volts		1.35 amps.
"A" at 6.3 volts		1.40 amps.
"B" at 135 volts	19 ma.	(Supplied from vibrator)
Fuse Rating	½ amp.	3 amp.
POWER OUTPUT		
Undistorted	1.2 watts	1.0 watts
Maximum	2.2 watts	1.6 watts

Mechanical Specifications

CABINET DIMENSIONS	8BT	8BK	8BT6	8BK6
Height	22⅛ inches	40 inches	22⅛ inches	40 inches
Width	17 inches	25½ inches	17 inches	25½ inches
Depth	9¼ inches	12⅛ inches	10¼ inches	12⅛ inches
WEIGHTS				
Net	28 pounds	56 pounds	38 pounds	66 pounds
Shipping	37 pounds	71 pounds	46 pounds	80 pounds

Chassis Base Dimensions .... 14¾ inches x 8 inches x 3¼ inches
Over-all Height of Chassis .... 9¼ inches
Operating Controls .... (1) Volume, (2) Tuning, (3) Range Selector, (4) Tone, (5) Power Switch (located on right side of cabinet).
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

These receivers employ the same type chassis. The table models 8BT and 8BT6 each employ an eight-inch, dust-proof, permanent-magnet, dynamic loudspeaker while the console Models 8BK and 8BK6 each employ a twelve-inch, dust-proof, permanent-magnet, dynamic loudspeaker. Models 8BT and 8BK obtain their plate supply from "B" batteries and their filament supply from either a 2½-volt Air-cell or a 2-volt storage battery. Models 8BT6 and 8BK6 obtain their plate supply from a compact, vibrator power-

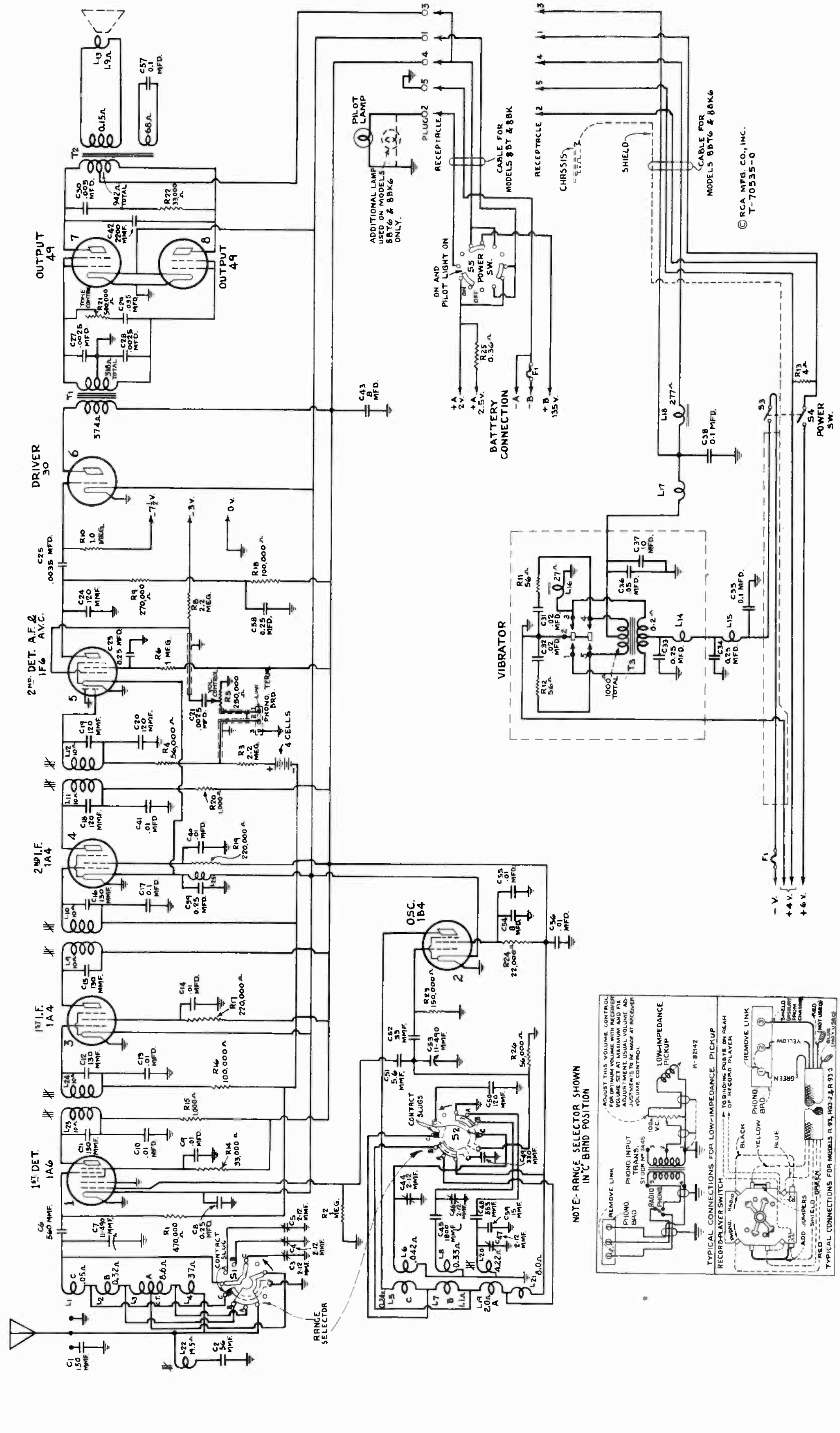
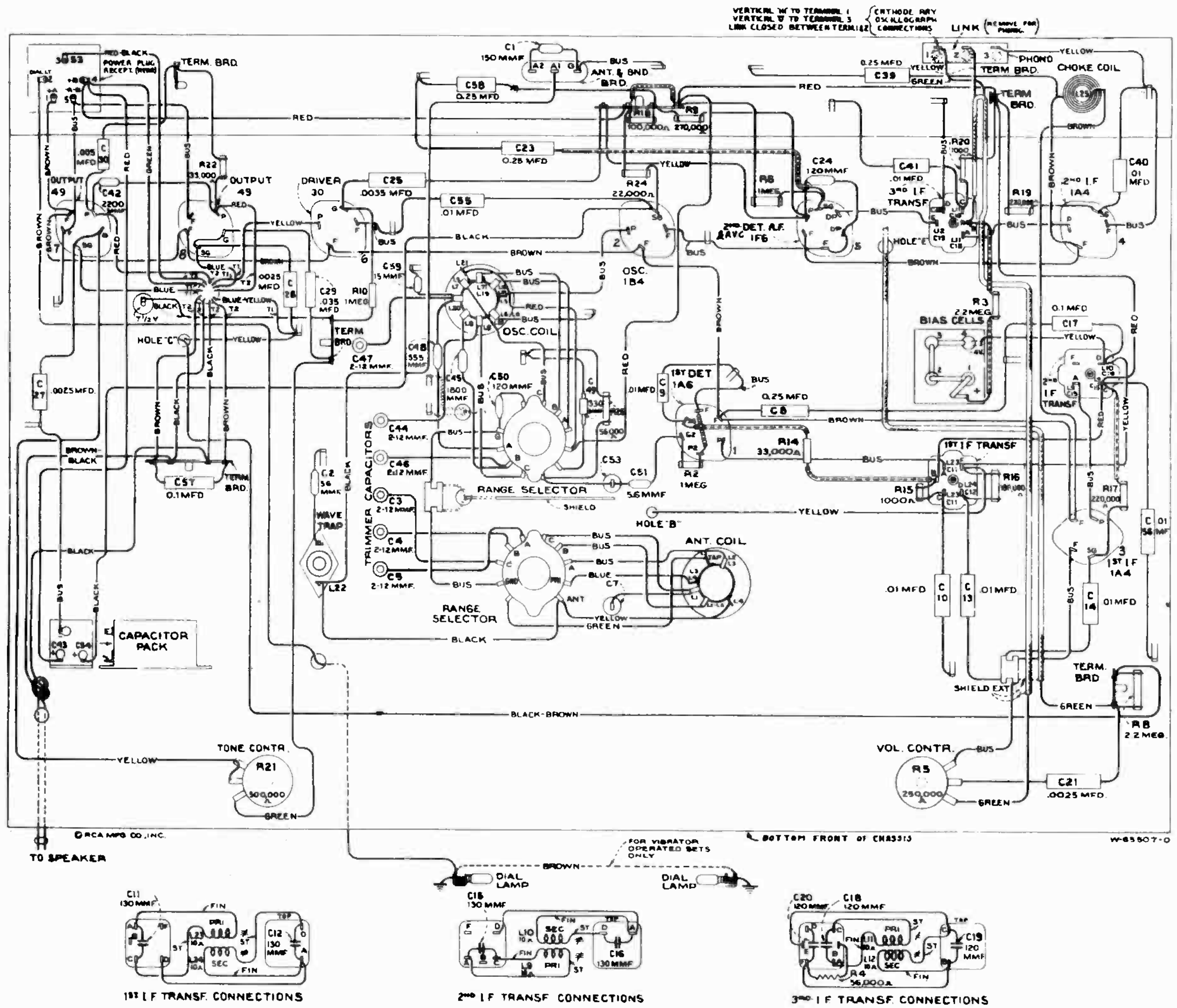
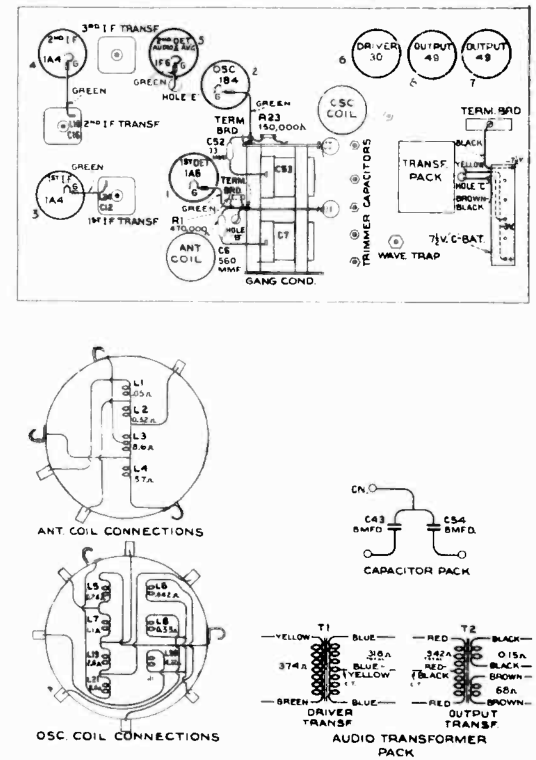


Figure 1—Schematic Circuit Diagram





SERVICE HINTS

(1) If charging apparatus is associated with the 8BT6—8BK6, a 0.25 mfd. capacitor should be inserted in the receiver ground lead.

(2) Reduction of hiss or background noise may be effected at slight sacrifice of sensitivity by increasing R-14 to 50,000—70,000 ohms.

Figure 2—Chassis Wiring Diagram

supply unit, which, in turn, is operated from a 6-volt storage battery. One cell (2 volts) of this same storage battery is used to supply filament voltage to the Radiotrons. The vibrator is of the "plug-in" type which permits ready removal or replacement. Models 8BT and 8BK have a pilot-lamp switch combined with the main power switch so that the pilot lamp may be turned off, after the receiver is tuned in, to conserve battery current.

The tuning range is continuous through the "Standard broadcast," "Medium wave," and "Short wave" bands. This extensive range includes the important short-wave broadcast bands at 49, 31, 25, 19, 16, and 13 meters in addition to channels assigned for police, amateur, and aviation communication.

Circuit Arrangement

The signal entering the antenna circuit is coupled to control grid No. 1 of the RCA-1A6 through a tuned r-f transformer. This transformer is tapped to provide correct inductance for the band being used, and at the same time selecting the proper winding which serves as the primary and shorts out the unused coils to prevent any interaction which might otherwise occur. The locally generated oscillator signal is fed to control grid No. 2 of the RCA-1A6 through capacitor C51. Separate windings are employed in the oscillator stage for each band. The unused portions of the oscillator coil are shorted out when not in use. The output of the first-detector stage is fed through a two-stage i-f amplifier, consisting of two RCA-1A4's and three i-f transformers, to the diode portion of the RCA-1F6. Such an i-f amplifier arrangement provides excellent selectivity and gain, while its design gives increased fidelity due to its flat-top characteristic. The audio frequency secured by the detection process develops a voltage across resistors R4 and R5. The voltage developed across R5 is applied as a.v.c. bias to the first detector and i-f tubes. The arm of the volume control R5 selects a portion of the audio voltage which is applied to the control grid of the RCA-1F6 for voltage amplification. The output of this stage is resistance-capacitance coupled to the RCA-30 driver tube. The output of the driver stage is transformer coupled to the class "B" push-pull output stage using RCA-49's. The output of this push-pull stage is transformer coupled to the permanent magnet dynamic loudspeaker. A tertiary winding on the output transformer shunted by C57 provides sharp cutoff of the high audio frequencies. A continuously variable high-frequency tone control R21 in series with C29 provides manual high-frequency tone control.

Models 8BT6 and 8BK6 obtain their plate supply from a vibrator-type power unit. The vibrator together with the power transformer T3 combine the functions of generating alternating current and rectification. Filter chokes and capacitors are built into this unit to eliminate interference (noise) which would otherwise be introduced into the receiver circuits.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as C1, L1, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Ratings of less than one ohm are generally omitted.

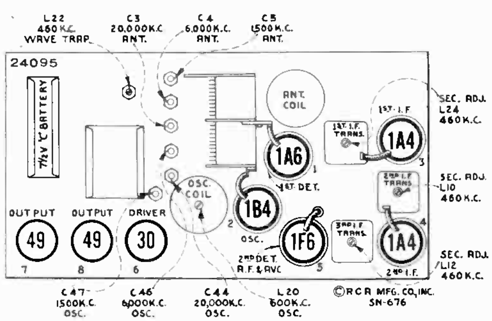


Figure 3—Radiotron, Coil, and Trimmer Locations

Caution: The four bias cells are used only for the purpose of supplying bias potential and should never be measured with an ordinary voltmeter or other device which draws any current. A simple check on these cells may be made by connecting a milliammeter in the plate circuit of either RCA-1A4 tube and noting the plate current reading. Then remove the two bias cells (3 and 4), being careful that the spring contact clips do not short-circuit them during removal. Connect a 4-volt battery between the + and — 4v. terminals of the bias cell board, and again note the plate current reading. If the first reading obtained (with bias cells) is more than 40% from the latter reading (with 4-volt battery), all bias cells should be replaced. This 40% difference is equivalent to a change of approximately 25% battery voltage.

Alignment Procedure

There are seven alignment adjustments provided in the antenna and oscillator coil tuned circuits. Six of these adjustments are plunger type air trimmers and require use of an **RCA Stock No. 12636 Adjusting Tool.** The i-f transformer adjustments are made by means of screws attached to molded magnetite cores.

The cathode-ray method of alignment is preferred due to the flat-top i-f characteristics of these receivers.

This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon**

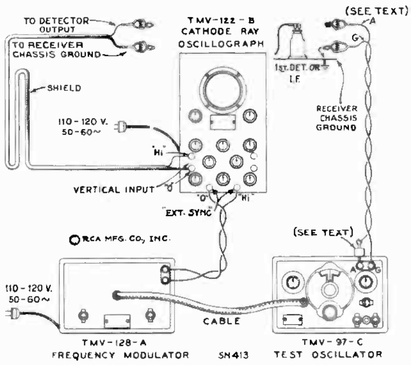


Figure 4—Alignment Apparatus Connections

Glow Indicator attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, and the test oscillator sweeping operations omitted. The i-f adjustments should be made so that the test-oscillator frequency can be shifted 2 kc above and below the 460 kc alignment frequency with little change in output. The r-f adjustments should be peaked.

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 4. Remove the plug of the frequency modulator cable from the test oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 2. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume control setting is optional.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of RCA-1A4 second i-f tube (with grid lead in place) through a **.05-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc,** place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L12** and **L11** (see figures 3 and 7) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape,

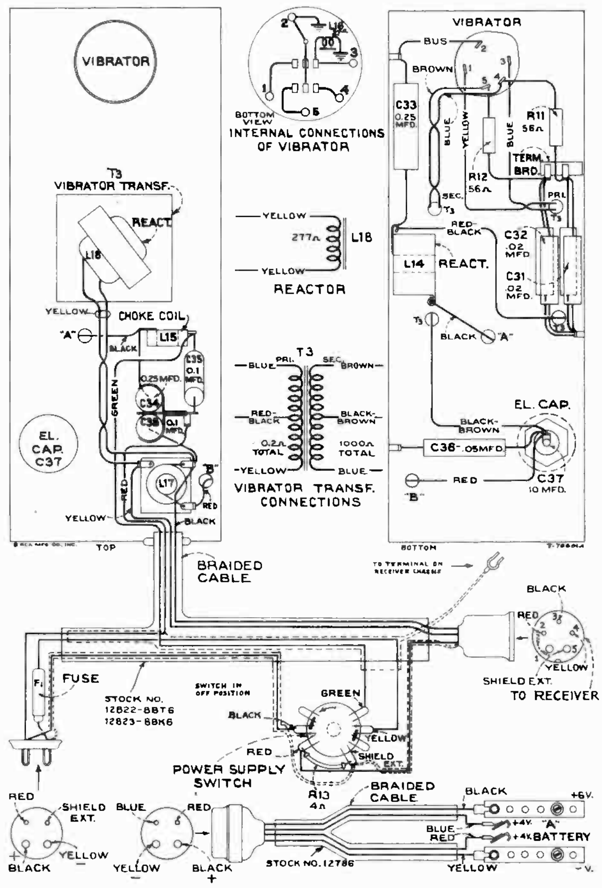


Figure 5—Power Unit Wiring (8BT6 and 8BK6)

totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator along with the **.05-mfd.** capacitor to the grid cap of the RCA-1A4 first i-f tube (with grid lead in place). Adjust the two second i-f transformer magnetite core screws **L10** and **L9** so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(h) Shift the "Ant." output of the test oscillator along with the **.05-mfd.** capacitor to the grid cap of the RCA-1A6 first detector tube. Adjust the two magnetite core screws **L24** and **L23** of the first i-f transformer so that they cause the forward and reverse curves to become coincident and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

Calibrate the pointer of the tuning dial by adjusting it to the extreme low-frequency end of dial scale **(530 kc)** with the plates of the gang tuning condenser in full mesh. Alignment must be made in the sequence of "Short wave" band, "Medium wave" band, "Wave-trap," and "Standard broadcast" band.

"Short Wave" Band

(i) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **300-ohm**

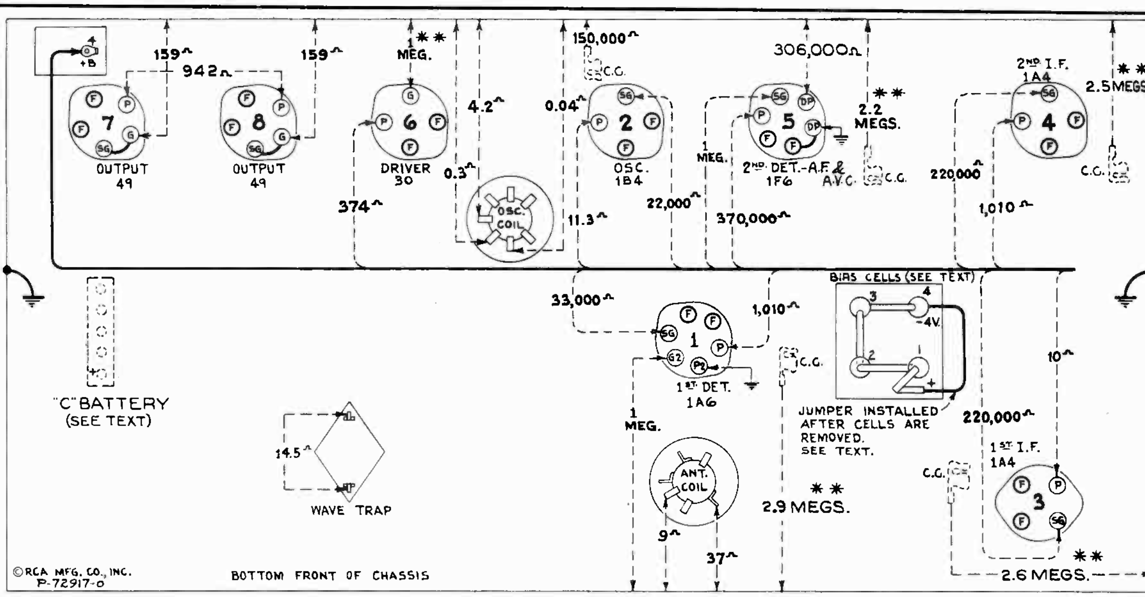


Figure 6—Resistance Diagram

Power-supply cable disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Bias cells and "C" battery removed—Volume setting optional

Resistance Measurements

***Before making any resistance measurements, remove the four bias cells and connect jumpers on bias-cell board as shown. Also, remove the "C" battery and connect the two leads (—7½ v. and —3 v.) to chassis ground. After measurements are completed, remove jumpers from bias-cell board and then carefully insert bias cells. Next, insert "C" battery and restore leads to their respective positions.*

The resistance values shown between Radiotron socket contacts, grid caps, resistors, terminals, and receiver chassis ground, on figure 6, have been carefully selected so as to facilitate a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Chassis Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ±20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

resistor. Remove the plug of the frequency-modulator cable from test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int."

(j) Set receiver range selector to its "Short wave" position and dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air trimmer **C44** until maximum (peak) amplitude of output is reached. Two peaks may be found. The peak with minimum capacity (plunger near out) should be used. Tighten lock nut. Adjust antenna air trimmer **C3** until maximum (peak) amplitude of output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The test oscillator signal should be faintly received at this position indicating that the adjustment of **C44** has been correctly made. No adjustments should be made while checking for this image signal.

"Medium Wave" Band

(k) Place receiver range selector to its "Medium wave" position with the receiver dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.**

Radiotron Plate Current Readings
Measured with Milliammeter Connected at Tube Socket Plate Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-1A6—1st Det.	1.2	ma.
(2)	RCA-1B4—Osc.	3.8	ma.
(3)	RCA-1A4—1st I.F.	0.9	ma.
(4)	RCA-1A4—2nd I.F.	0.9	ma.
(5)	RCA-1F6—2nd Det.—A.F.—A.V.C.	0.25	ma.
(6)	RCA-30 —Driver	3.2	ma.
(7)	RCA-49 —Output	1.5	ma.
(8)	RCA-49 —Output	1.5	ma.

Adjust the oscillator air trimmer **C46** for maximum (peak) amplitude of output as shown by the waves on the oscillograph screen. Two peaks may be found. The peak obtained with minimum capacity (plunger near out) should be used. Tighten lock nut. Adjust antenna air trimmer **C4** for maximum (peak) output. Tighten lock nut.

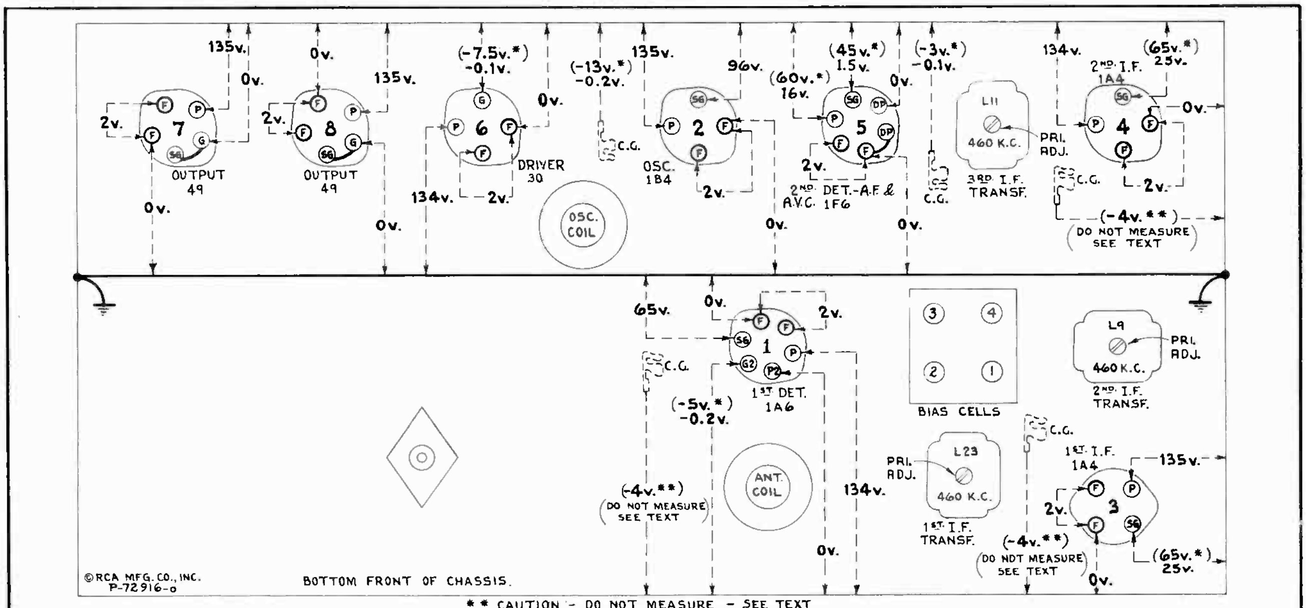


Figure 7—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured with all batteries at normal voltage—Tuned to approximately 1,000 kc ("Standard broadcast")—No signal being received—Volume control optional

Radiotron Socket Voltages

CAUTION: Do not attempt to measure voltages on control grids of RCA-1C6 or RCA-1A4, with any conventional voltmeter, due to presence of bias cells. See "Caution" under "Service data" for method of measuring these cells.

Note: *Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, and 250 volts. Use the nearest range above the voltage to be measured.

"Wave-Trap" Adjustment

(l) Connect the output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph.

"Standard Broadcast" Band

(m) Reduce output of test oscillator to minimum. Set receiver dial pointer to **600 kc.** Tune the test oscillator to **600 kc** and increase its output until a deflection is noticeable on the oscillograph screen.

(n) Adjust oscillator magnetite core screw **L20** (top of oscillator coil) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(o) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc.** Adjust the oscillator and antenna air trimmers **C47** and **C5** for maximum (peak) output.

(p) Set test oscillator to **600 kc** and tune receiver to pick up this signal **near 600 kc.** Re-adjust the oscillator magnetite core screw **L20** for maximum (peak) output while rocking the receiver gang tuning condenser back and forth through this signal.

(q) Repeat adjustments in (o) above to correct for any changes in the oscillator tuning caused by the adjustment of **L20.** Tighten lock nuts on **C47** and **C5** after each is adjusted.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Phonograph Attachment

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R–93, R–93–2, and R–93–S Record Players are shown on the schematic diagram (figure 1).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very

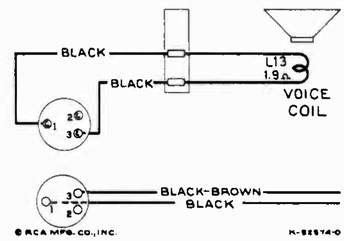


Figure 8—Loudspeaker Wiring

light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

Power Supply (Models 8BT and 8BK)

Filament voltage for these receivers is obtained from either a 2½-volt Air-cell or a 2-volt storage battery. When the Air-cell is used, the 0.36 ohm resistor **R25** must be connected in series with the A-battery lead as shown on figure 9. When operating on a 2-volt storage battery, this resistor **R25** should

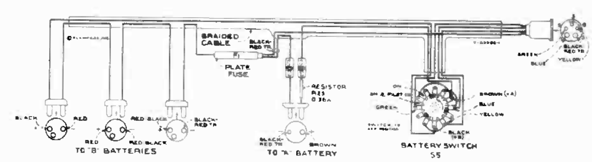


Figure 9—Battery Cable (8BT and 8BK)
(Stock No. 12938)

be removed. Plugs are provided on the battery cable (see figure 9) for plugging in the Air-cell and B batteries. The A-battery plug should be removed when operating on a 2-volt storage battery. The 7½-volt C battery is located on the top-side of the chassis and securely held in place by a metal cover (see figure 3). The four bias cells are located underneath the chassis (see figures 2 and 6).

Power Supply (Models 8BT6 and 8BK6)

The vibrator power unit supplies the necessary plate, grid, and cathode voltages for proper operation of these receivers. It contains a plug-in type vibrator, step-up transformer, and an efficient filter system. Rectification of the high voltage is accomplished by means of the synchronous vibrator. The complete unit is acoustically shielded to prevent noise. The vibrator-power-unit chassis should be insulated from the receiver chassis, when removed for service, to avoid vibrator buzz. The vibrator unit has been carefully adjusted by means of special equipment to insure quiet operation over an extensive period of life. No adjustments should be attempted on a vibrator suspected of being in a defective condition, but a renewal installed. The plug-in arrangement affords easy removal or replacement.

A 6-volt storage battery supplies power for the vibrator and for the tube filaments. Four connections are required to the 6-volt battery. The + 6-volt (black) lead and the + 4-volt (blue) lead supply filament voltage to the receiver, while the + 4-volt (red) lead and — volt (yellow) lead supply voltage to the vibrator power unit. The two 4-volt leads (blue and red) should make separate connections to the same battery strap to avoid against vibrator buzz which might otherwise result if these two leads are joined together or touch each other. The 7½-volt C battery is located on the top-side of the receiver chassis and securely held in place by a metal cover (see figure 3). The four bias cells are located underneath the receiver chassis (see figures 2 and 6).

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12806	Board—3-contact antenna and ground terminal board and bracket assembly	.25
12717	Board—3-contact phonograph terminal board	.22
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12118	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer (C3, C4, C5, C44, C46, C47)	.38
12814	Capacitor—5.6 Mmfd. (C51)	.20
12896	Capacitor—15 Mmfd. (C59)	.20
12948	Capacitor—33 Mmfd. (C52)	.20
12723	Capacitor—56 Mmfd. (C2)	.20
12950	Capacitor—120 Mmfd. (C50)	.25
12404	Capacitor—120 Mmfd. (C18, C19, C20)	.26
12724	Capacitor—120 Mmfd. (C24)	.28
12946	Capacitor—130 Mmfd. (C11, C12, C15, C16)	.20
12725	Capacitor—150 Mmfd. (C1)	.28
12952	Capacitor—330 Mmfd. (C49)	.25
12727	Capacitor—555 Mmfd. (C48)	.20
12537	Capacitor—560 Mmfd. (C6)	.20
12947	Capacitor—1,800 Mmfd. (C45)	.40
12951	Capacitor—2,200 Mmfd. (C42)	.40
5107	Capacitor—.0025 Mfd. (C21, C27, C28)	.16
5005	Capacitor—.0035 Mfd. (C25)	.16
4868	Capacitor—.005 Mfd. (C30)	.20
4858	Capacitor—.01 Mfd. (C9, C10, C13, C14, C40, C41, C55, C56)	.25
5196	Capacitor—.035 Mfd. (C29)	.18
4841	Capacitor—0.1 Mfd. (C17, C57)	.22
4840	Capacitor—0.25 Mfd. (C8, C23, C39, C58)	.30
12804	Capacitor—Pack, comprising 2 sections 8 Mfd. each (C43, C54)	1.70
12179	Coil—Choke coil (L25)	.45
12708	Coil—Antenna coil and shield complete (L1, L2, L3, L4)	2.04
12943	Coil—Oscillator coil and shield complete (L5, L6, L7, L8, L19, L20, L21)	2.30
12701	Condenser—2-gang variable tuning condenser (C7, C53)	4.00
5119	Connector—3-contact female connector for speaker cable	.25
12805	Connector — 5-contact male receptacle located on rear of receiver chassis for power cable	.20
12800	Core—Adjustable core and stud for Stock No. 12943	.20
12006	Core—Adjustable core and stud for Stock No. 12945 and 12949	.22
12664	Core—Adjustable core and stud for Stock No. 12654	.22

Stock No.	Description	List Price
12681	Cell—Bias cell	.30
12940	Dial—Station selector dial	.85
12702	Drive—Vernier drive complete for variable tuning condenser	.68
12808	Holder—Bias cell holder	.35
12712	Indicator—Station selector indicator pointer	.22
4348	Lamp—Dial lamp, 2-volt	.38
12941	Mask—Dial light diffuser	.15
5112	Resistor—1,000 ohm—carbon type—¼ watt—Package of 5 (R15, R20)	1.00
11305	Resistor—22,000 ohm—carbon type—¼ watt—Package of 5 (R24)	1.00
11364	Resistor—33,000 ohm—carbon type—¼ watt—Package of 5 (R22)	1.00
12454	Resistor—33,000 ohm—insulated type—¼ watt—Package of 5 (R14)	1.00
11282	Resistor—56,000 ohm—carbon type—1/10 watt—Package of 5 (R4)	.75
5029	Resistor—56,000 ohm—carbon type—¼ watt—Package of 5 (R26)	1.00
5145	Resistor—100,000 ohm—carbon type—¼ watt—Package of 5 (R16, R18)	1.00
12478	Resistor—150,000 ohm—carbon type—1/10 watt—Package of 5 (R23)	.75
5158	Resistor—220,000 ohm—carbon type—¼ watt—Package of 5 (R17, R19)	1.00
11323	Resistor—270,000 ohm—carbon type—¼ watt—Package of 5 (R9)	1.00
11452	Resistor—470,000 ohm—carbon type—1/10 watt—Package of 5 (R1)	.75
3033	Resistor—1 meg.—carbon type—¼ watt—Package of 5 (R2, R6)	1.00
12200	Resistor—1 meg.—insulated type—¼ watt—Package of 5 (R10)	1.00
11626	Resistor—2.2 meg.—carbon type—¼ watt—Package of 5 (R3, R8)	1.00
12651	Shield—Coil shield for Stock No. 12708	.22
12710	Shield—Coil shield for Stock No. 12943	.28
12008	Shield—I.F. transformer shield for Stock No. 12945 and 12949	.28
12581	Shield—I.F. transformer shield top for Stock No. 12949	.36
12607	Shield—I.F. transformer shield top for Stock No. 12945	.30
4236	Shield—Front 1A4 Radiotron shield	.22
3682	Shield—1A4, 1B4, 1A6 or 1F6 Radiotron shield	.22
4794	Socket—4-contact 1A4, 1B4 or 30 Radiotron socket	.15
4814	Socket—5-contact 49 Radiotron socket	.15
4786	Socket—6-contact 1A6 or 1F6 Radiotron socket	.15
11199	Socket—Dial lamp socket	.14

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price	Stock No.	Description	List Price
12007	Spring—Retaining spring for core Stock Nos. 12800, 12006 and 12664—Package of 10	.36	12824	Switch—Power switch (S3, S4)	1.00
12942	Switch—Range switch (S1, S2)	1.60	12816	Transformer—Vibrator transformer (T3)	3.00
11219	Tone Control—(R21)	1.00	12817	Vibrator—Complete (L16)	4.85
12944	Transformer—Audio transformer pack (T1, T2)	5.20	4285	Washer—Fuse connector insulating washer —Package of 10	.22
12945	Transformer—First I.F. transformer complete (L23, L24, C11, C12)	1.85		MISCELLANEOUS ASSEMBLIES	
12945	Transformer — Second I.F. transformer complete (L9, L10, C15, C16)	1.85	4289	Body—Fuse connector female body—Package of 10 (8BT—8BK)	.35
12949	Transformer—Third I.F. transformer complete (L11, L12, C18, C19, C20, R4)	2.10	12938	Cable—Power cable (set end) approximately 60-in. long complete with four 2-contact male connectors and one 5-contact female connector—less power switch (8BT—8BK)	4.40
12654	Trap—Wave trap (L22)	.75	12786	Cable—Power cable (battery section) complete with battery connectors and female section of 4-contact connector (8BT6—8BK6)	2.00
11589	Volume Control—(R5)	.85	4288	Cap—Fuse connector male cap—Package of 10 (8BT—8BK)	.36
	REPRODUCER ASSEMBLIES Console Model 8BK—8BK6		12827	Connector—2-contact and guide pin male connector and cover for power cable Stock No. 12938 (8BT—8BK)	.30
12667	Cone—Reproducer cone and dust cap (L13)	1.00	12828	Connector—2-contact male connector for power cable Stock No. 12938 (8BT—8BK)	.20
5118	Plug—3-contact male connector for reproducer	.25	12788	Connector—4-volt battery connector for Stock No. 12786—Package of 2 (8BT6—8BK6)	.20
9713	Reproducer—Complete	14.85	12790	Connector—4-contact female connector for cable Stock No. 12786 (8BT6—8BK6)	.45
	REPRODUCER ASSEMBLIES Table Model 8BT—8BT6		12791	Connector—5-contact female connector and cover for power cable for Stock No. 12938 (8BT—8BK)	.30
12642	Cone—Reproducer cone and dust cap (L13)	.94	12787	Connector—6-volt battery connector for Stock No. 12786—Package of 2 (8BT6—8BK6)	.20
5118	Plug—3-contact male connector for reproducer	.25	12698	Crystal—Station selector dial escutcheon and crystal	1.02
9712	Reproducer—Complete	6.60	4286	Ferrule—Fuse connector ferrule and bushing—Package of 10 (8BT—8BK)	.38
	VIBRATOR ASSEMBLIES 8BT6—8BK6		3748	Fuse—½ ampere—Package of 5 (F1) (8BT—8BK)	.40
4289	Body—Fuse connector female body—Package of 10	.35	4290	Insulator—Fuse connector body insulator —Package of 10 (8BT—8BK)	.35
12822	Cable—Power cable (set end) approximately 63-in. long complete with one 5-contact female connector and one 4-contact male connector—less power switch—used in 8BT6 Model only	4.50	12699	Knob—Station selector knob (large)—Package of 5	68
12823	Cable—Power cable (set end) approximately 44-in. long complete with one 5-contact female connector and one 4-contact male connector—less power switch—used in 8BK6 Model only	4.00	12700	Knob — Station selector vernier knob (small)—Package of 5	.58
4288	Cap—Fuse connector male cap—Package of 10	.36	11347	Knob—Volume control, range switch, tone switch or power switch knob—Package of 5	.75
4937	Capacitor—.01 Mfd. (2 used in parallel) (C31, C32)	.25	12939	Resistor—0.36 ohm—flexible type—Package of 5 (R25) (8BT—8BK)	.55
4836	Capacitor—.05 Mfd. (C36)	.30	11377	Screw—Chassis mounting screw assembly for table model only—Package of 4 (8BT—8BT6)	.12
4841	Capacitor—0.1 Mfd. (C35)	.22	11210	Screw—Chassis mounting screw assembly for console model only—Package of 4 (8BK—8BK6)	.28
12821	Capacitor—0.1 Mfd. (C38)	.40	12789	Screw—Cone point set screw for connector Stock No. 12788—Package of 10 (8BT6—8BK6)	.20
12820	Capacitor—0.25 Mfd. (C34)	.45	4284	Spring—Fuse connector spring—Package of 10 (8BT—8BK)	.30
4840	Capacitor—0.25 Mfd. (C33)	.30	11349	Spring—Retaining spring for knob Stock No. 11347 and 12700—Package of 5	.25
11387	Capacitor—10 Mfd. (C37)	.86	4982	Spring—Retaining spring for knob Stock No. 12699—Package of 10	.50
12819	Coil—Vibrator choke coil and terminal board assembly (L17)	.40	12829	Switch—Power switch (S3) (8BT—8BK)	1.05
12179	Coil—Vibrator choke coil (L15)	.45	4285	Washer—Fuse connector insulating washer —Package of 10 (8BT—8BK)	.22
12793	Connector—4-contact male connector for power cable	.25			
12791	Connector—5-contact female connector and cover for power cable	.30			
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10	.38			
10907	Fuse—3-ampere—Package of 5 (F1)	.40			
4290	Insulator—Fuse connector body insulator —Package of 10	.35			
12815	Reactor—Air core reactor (L14)	.80			
12818	Reactor—Iron core (L18)	.95			
12825	Resistor—4 ohm—flexible type—(R13)	.25			
5034	Resistor—56 ohm—carbon type—½ watt —Package of 5 (R11, R12)	1.00			
4814	Socket—5-contact vibrator socket	.15			
4284	Spring—Fuse connector spring—Package of 10	.30			

First Edition

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RCA VICTOR MODELS 8T2, 8T11, and 8K11

Eight-Tube, Three-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges

"Long Wave" (X)	155-320 kc
"Medium Wave" (A)	530-1,500 kc
"Short Wave" (C)	5,400-18,000 kc

Alignment Frequencies

"Long Wave" (X)	175 kc (osc.), 300 kc (osc., det., ant.)
"Medium Wave" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Short Wave" (C)	15,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

Radiotron Complement

(1)	RCA-6K7	Radio-Frequency Amplifier
(2)	RCA-6A8	First Detector—Oscillator
(3)	RCA-6K7	Intermediate Amplifier
(4)	RCA-6H6	Second Detector—A.V.C.
(5)	RCA-6F5	Audio Voltage Amplifier
(6)	RCA-6F6	Audio Power Amplifier
(7)	RCA-5Z4	Full-Wave Rectifier
(8)	RCA-6E5	Tuning Indicator

Pilot Lamps (3) .... Mazda No. 46, 6.3 volts, 0.25 ampere

Power Supply Ratings

Rating A	105-125 volts, 50-60 cycles, 100 watts
Rating B	105-125 volts, 25-60 cycles, 105 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 100 watts

Power Output Rating

Undistorted	$2\frac{1}{4}$ watts
Maximum	5 watts

Loudspeaker

Type	Electrodynamic
Voice Coil Impedance	2.25 ohms at 400 cycles

Mechanical Specifications

Cabinet Dimensions	Model 8T2	Model 8T11	Model 8K11
Height	$21\frac{3}{4}$ inches	$25\frac{3}{8}$ inches	$39\frac{3}{4}$ inches
Width	$15\frac{3}{4}$ inches	$17\frac{1}{8}$ inches	26 inches
Depth	$9\frac{1}{8}$ inches	$9\frac{1}{2}$ inches	13 inches
Weights			
Net	35 pounds	47 pounds	65 pounds
Shipping	41 pounds	(2) 140 pounds	130 pounds

Chassis Base Dimensions .... $13\frac{7}{8}$ inches x $7\frac{3}{4}$ inches x $2\frac{1}{2}$ inches

Over-all Height of Chassis .... $7\frac{3}{4}$ inches

Operating Controls .... (1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch—Tone

Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

These receivers employ the same type chassis and have many distinctive features. Models 8T2 and 8T11 employ an 8-inch dynamic loudspeaker and Model 8K11 employs a 12-inch dynamic loudspeaker. The superheterodyne circuit is used with such features of design as all-metal tubes, a radio-frequency amplifier stage, "Magic Eye" tuning indicator, improved antenna wave-trap, aural compensated volume control, 3-position tone control with music-voice switch, automatic volume control, resistance coupled audio system, phonograph terminal board, band selective illumination of dial scales, and a dust-proof loudspeaker. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of 10 to 1 with a 50 to 1 vernier permits ease of tuning, especially in the "Short wave" band.

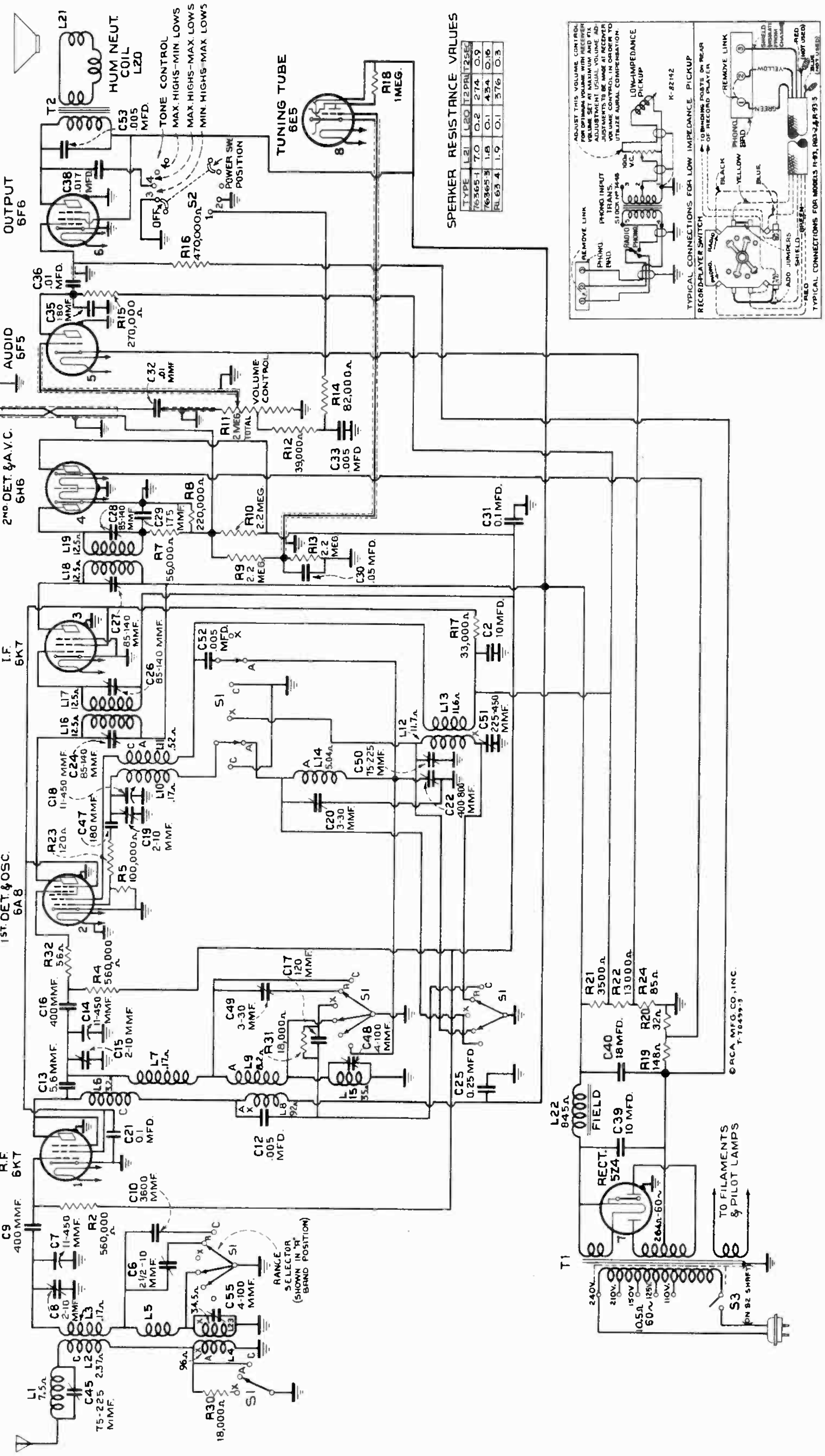


Figure 1—Schematic Circuit Diagram

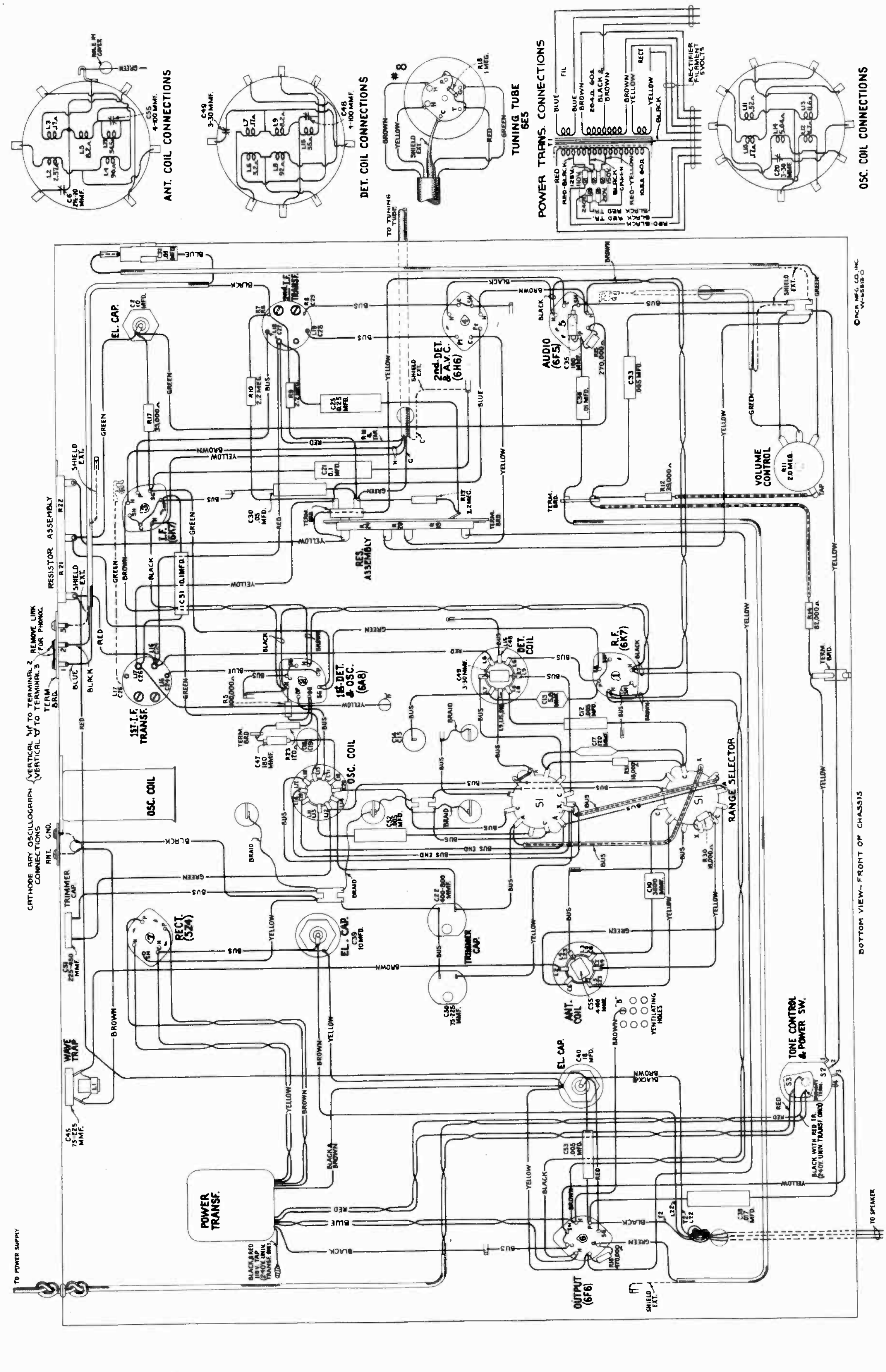


Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The conventional Superheterodyne type of circuit, consisting of an r-f stage, a combined first-detector—oscillator stage, a single i-f stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, an audio power-output stage, and a high-voltage rectifier power-supply stage is used.

Tuned Circuits

The antenna coil system and the detector coil system each consist of two series-connected primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is wound on a single form. A range selector switch (S1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for the "Medium wave" (A) band as well as the "Long wave" (X) band. A series trimmer is also associated with the "Medium wave" (A) and "Long wave" (X) band oscillator coils.

The intermediate-frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube (No. 1 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The No. 2 diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R10 and R8, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio-voltage-amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first-audio stage and the power-output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of the output tube. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S2).

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. Correct tuning of the receiver to the incoming carrier is evidenced by the minimum width of the dark sector of the tuning tube.

Rectifier

The power required for operation of this receiver is supplied through transformer T1. This transformer has an efficient electrostatic shield between its primary and secondary windings. This shield prevents interference which is on the power-supply circuit from entering the receiver and conversely reduces the tendency of the receiver to re-radiate into the power circuit. An RCA-5Z4 furnishes the d-c voltages necessary for plate, screen, cathode, and grid potentials. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to locate causes for defective operation if such develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R30, L1, C45, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, five in the oscillator coil system, three in the detector coil system, and three in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of these receivers can only be obtained when the alignment is performed with adequate and reliable test apparatus and in the sequence given. The manufacturer of these instruments has a complete assortment of such service equipment available for sale through its dealers and distributors.

A test oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual indication of the receiver output during the adjustments is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The **RCA Stock No. 9595 Full-Range Test Oscillator** and the **RCA Stock No. 4317 Neon Output Indicator** are especially suitable and fulfill the above requirements.

The following procedure should be adhered to in adjusting the various trimmer capacitors.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by figure 6. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice-coil circuit. Attach the receiver chassis to a good external ground. Connect the output of the test oscillator between the control-grid of the RCA-6A8 first-detector tube and chassis-ground through a **.001 mfd.** capacitor. Tune the test oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point where no interference is encountered from broadcast stations, or short stator of oscillator tuning capacitor **C18** to chassis eliminating local oscillator signals. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Adjust the two trimmers, **C28** and **C27** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, **C26** and **C24,** of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test-oscillator output so that the receiver output indication is always as low as possible. By doing so, broadness of tuning, due to a.v.c., action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the inter-action between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The eleven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by figures 3 and 6. The three trimmers which are at all times directly in shunt with the variable tuning condensers necessitate that the "Short wave" (C) band be aligned first. The range selector switch should, therefore, be turned to its "Short wave" position for the first adjustments. Leave the output indicator connected to the output system.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full-mesh (maximum capacity) position and adjust the dial pointer so that its end points to the **horizontal** graduation **(520 kc)** at the low-frequency end of the "Medium wave" (A) dial scale.

Wave-Trap Adjustment

Connect the test oscillator to the antenna and ground terminals of the receiver, leaving it tuned to **460 kc.** Adjust the wave-trap trimmer **C45** for maximum suppression of the **460 kc** signal. An increase in test-oscillator output may be necessary before the point of minimum output (maximum suppression of signal) is obtained.

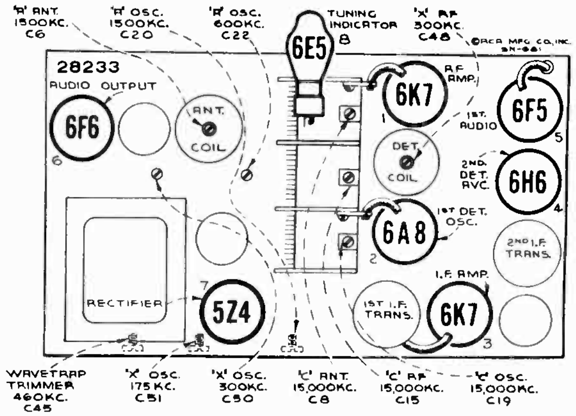


Figure 3—Radiotron and R-F Trimmer Locations

"Short Wave" Band

(a) Adjust the test oscillator to **15,000 kc** and set the receiver tuning control to a dial reading of **15,000 kc.**

(b) Adjust trimmer **C19** on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of **maximum trimmer capacitance** is correct and should be used. The local (heterodyne) oscillator will be **460 kc** below the signal frequency at this adjustment point.

(c) Adjust trimmer **C15** of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **15,000 kc** input signal, until maximum receiver output results from these combined operations.

(d) With the receiver tuning control set to **15,000 kc** adjust trimmer **C8** on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.

"Medium Wave" Band

(e) Change the receiver range selector to its "Medium wave" (A) band position and set the receiver tuning control to a dial reading of **1,500 kc.** Tune the test oscillator to **1,500 kc** and regulate its output to produce a slight indication on the receiver output indicating device.

(f) Adjust the high-frequency trimmers of the oscillator, detector, and antenna coils, **C20, C49** and **C6** respectively, to the points at which each produces maximum indicated receiver output.

(g) Shift the test-oscillator frequency to **600 kc** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(h) Adjust the low-frequency trimmer **C22** of the oscillator coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of **C19, C15** and **C8** should be corrected at **15,000 kc** as in (b), (c), and (d); also **C20, C49** and **C6** should be corrected at **1,500 kc,** as in (f) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer **C22.**

"Long Wave" Band

(i) Change receiver band selector to "Long wave" (X) band and set receiver tuning control to a dial reading of **300 kc.** Tune test oscillator to **300 kc** and adjust oscillator, detector, and antenna trimmers **C50, C48** and **C55,** respectively, for maximum indicated receiver output.

(j) Set receiver to **175 kc** and tune test oscillator to **175 kc.** Adjust trimmer **C51** for maximum indicated output, simultaneously rocking tuning control of the receiver backward and forward through the signal.

(k) The adjustment of **C50, C48** and **C55** should now be repeated at **300 kc** as described in (i) to compensate for any changes caused by the adjustment of the low-frequency trimmer **C51.**

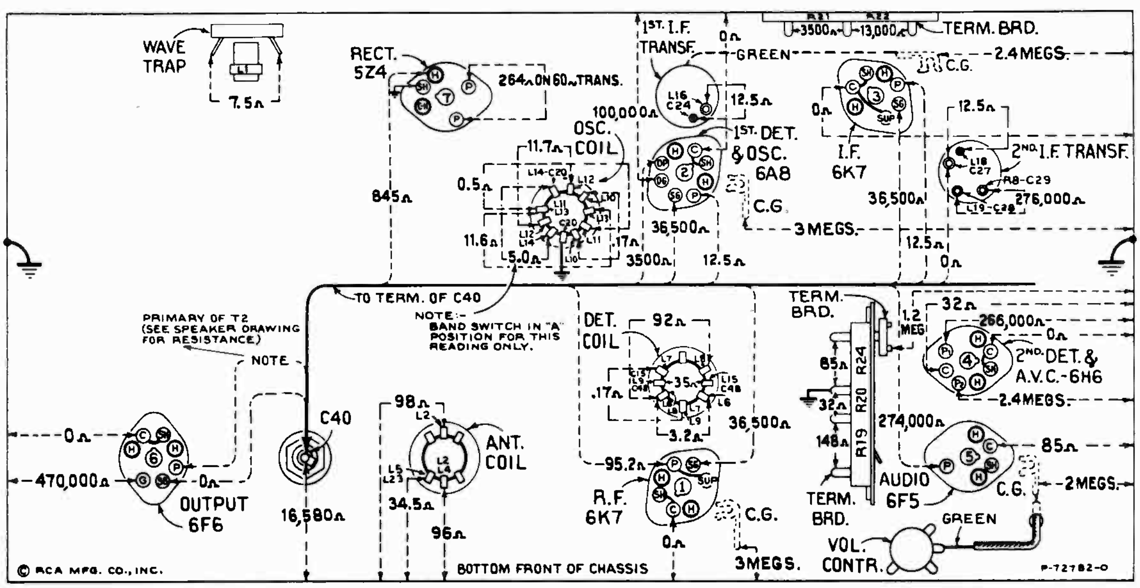
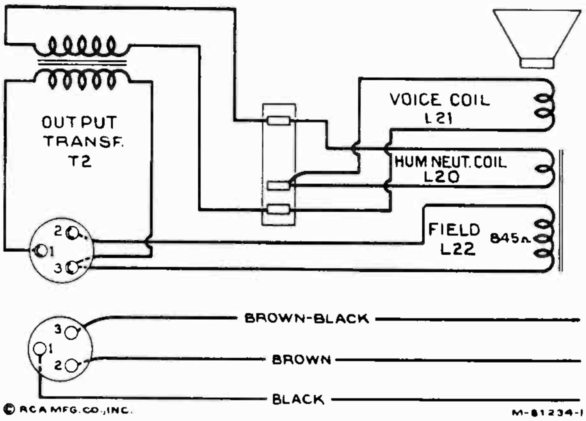


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Long wave" position—Volume control maximum—Power switch–Tone in "OFF" position

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagram, figure 2, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.



TYPE	L21	L20	T2 PRI	T2 SEC
76365-1	7.0	0.2	274	0.9
76365-3	1.8	0.1	434	0.16
RL63-4	1.9	0.1	376	0.3

Figure 5—Loudspeaker Wiring
Coil resistances type RL70-1, same as RL63-4

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit

Radiotron Cathode Current Readings
Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F	12.5 ma.
(2)	RCA-6A8—Det.-Osc.	13.8 ma.
(3)	RCA-6K7—I.F.	9.0 ma.
(4)	RCA-6H6—2nd Det.-A.V.C.	—
(5)	RCA-6F5—Audio	0.25 ma.
(6)	RCA-6F6—Power	40.0 ma.
(7)	RCA-5Z4—Rect.	90.0 ma.*
(8)	RCA-6E5—Eye	3.0 ma.

(* Cannot be measured at socket.)

Typical methods of connecting a low-impedance pick-up, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 1).

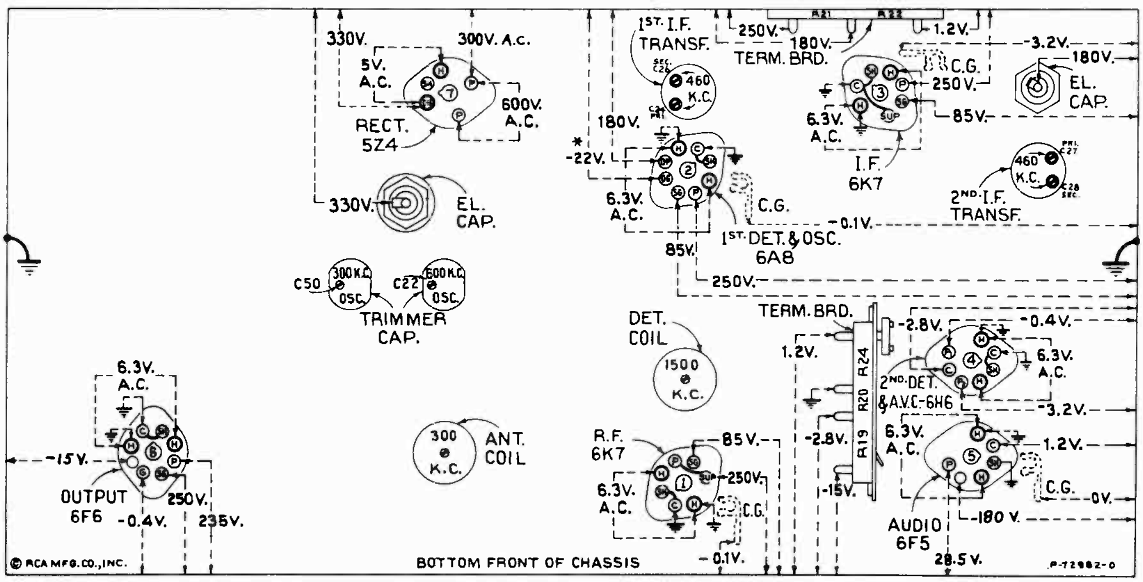
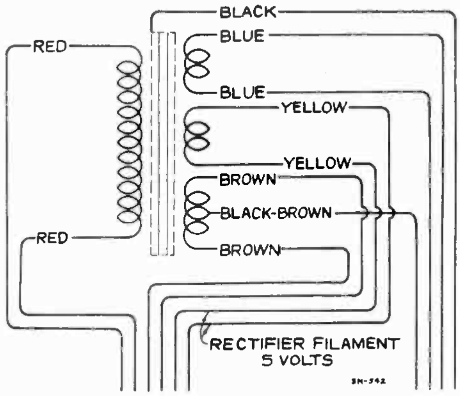


Figure 6—Radiotron Socket Voltages, Coil, and Trimmer Locations
Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Power switch–Tone full clockwise

Radiotron Socket Voltages

Note: The asterisk (*) value may vary appreciably. The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 6 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000 ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.



D. C. Resistance Values

110 volts, 50-60 cycles	110 volts, 25 cycles
Primary, 5.34 ohms	Primary, 7.37 ohms
Secondary, 330 ohms	Secondary, 430 ohms

Figure 7—Standard Transformer

SERVICE HINT

Excessive heating of the 6E5 tube may be due to high cathode current — in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES		13094	Dial—Station selector dial scale	$1.05
12706	Arm—Arm and hub assembly for operating shutter	$0.22	11394	Foot—Chassis foot assembly—Package of 2	.70
13098	Board—Antenna and ground terminal board	.25	12712	Indicator—Station selector indicator pointer	.22
12717	Board—Phonograph terminal board	.22	5226	Lamp—Dial lamp—Package of 5	.70
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	.43	12718	Mask—Dial Light Diffuser with colored screen	.40
11625	Cable—Radiotron tuning tube cable complete with socket	1.26	11393	Resistor—Voltage divider resistor—comprising one 3,500 ohm and one 13.000 ohm sections—(R21, R22)	.74
12511	Cap—Contact cap—Package of 5	.15	11329	Resistor—Voltage divider resistor— comprising one 148 ohm, one 32 ohm and one 85 ohm sections— (R19, R20, R24)	.52
4955	Capacitor—Adjustable trimmer (C45)	.48	12075	Resistor—56 ohms—Flexible type complete with contact cap—(R32)	.28
11256	Capacitor—Adjustable trimmer (C50)	.48	12071	Resistor—120 ohms—Carbon type—¼ watt—(R23)—Package of 5	1.00
11465	Capacitor—Adjustable trimmer (C22)	.48	12070	Resistor—18,000 ohms—Carbon type—1/10 watt—(R30, R31)—Package of 5	.75
12065	Capacitor—Adjustable trimmer (C51)	.65	5033	Resistor—33,000 ohms—Carbon type—1 watt—(R17)—Package of 5	1.10
12814	Capacitor—5.6 Mmfd.—(C13)	.20	11322	Resistor —39,000 ohms—Carbon type—¼ watt—(R12)—Package of 5	1.00
12974	Capacitor—120 Mmfd.—(C17)	.20	11365	Resistor—82,000 ohms—Carbon type—¼ watt—(R14)—Package of 5	1.00
13003	Capacitor—180 Mmfd.—(C35, C47)	.20	3118	Resistor—100.000 ohms—Carbon type—¼ watt—(R5)—Package of 5	1.00
5116	Capacitor—175 Mmfd.—C29)	.18	11453	Resistor—270,000 ohms—Carbon type—1/10 watt—(R15)—Package of 5	.75
11290	Capacitor—400 Mmfd.—(C9, C16)	.25	11452	Resistor—470,000 ohms—Carbon type—1/10 watt—(R16)—Package of 5	.75
11621	Capacitor—3,600 Mmfd.—(C10)	.38	11397	Resistor 560,000 ohms—Carbon type—1/10 watt—(R2, R4)—Package of 5	.75
4868	Capacitor—.005 Mfd.—(C12, C33, C52, C53)	.20	12013	Resistor—1 megohm—Carbon type—1/10 watt—(R18)—Package of 5	.75
11451	Capacitor—.017 Mfd.—(C38)	.18	11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R9, R10, R13)—Package of 5	1.00
11395	Capacitor—.01 Mfd.—(C32)	.18	4669	Screw—No. 8-32 set screw for arm stk No. 12706—Package of 10	.25
4858	Capacitor—.01 Mfd.—(C36)	.25	12064	Shield—Antenna or detector coil shield	.28
4839	Capacitor—0.1 Mfd.—(C21)	.28			
4841	Capacitor—0.1 Mfd.—(C31)	.22			
5170	Capacitor—0.25 Mfd.—(C25)	.25			
4836	Capacitor—.05 Mfd.—(C30)	.30			
11240	Capacitor—10 Mfd.—(C39)	1.08			
11387	Capacitor—10 Mfd.—(C2)	.86			
5212	Capacitor—18 Mfd.—(C40)	1.16			
12061	Coil—Antenna coil—Less shield—(L2, L3, L4, L5, L23, C6, C55)	1.90			
12062	Coil—Detector coil—Less shield—(L6, L7, L8, L9, L15, C48, C49)	1.94			
12063	Coil—Oscillator coil—Less shield—(L10, L11, L12, L13, L14, C20)	2.62			
12965	Condenser—Three-gang variable tuning condsenser—(C7, C8, C14, C15, C18, C19)	6.15			

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
11604	Shield—Oscillator coil shield	$0.24
11390	Shield—Intermediate frequency transformer shield	.25
12735	Shield—Dial lamp shield—Package of 5	.25
12971	Shutter—Dial scale holder and shutter assembly	.85
11222	Socket—Dial lamp socket	.18
11195	Socket—5-contact rectifier Radiotron socket	.15
11198	Socket—7-contact 6K7—6F5—or 6H6 Radiotron socket	.15
11196	Socket—8 contact 6A8 or 6F6 Radiotron socket	.15
12966	Switch—Range switch—(S1)	1.75
11392	Switch—Tone control and power switch assembly—(S2, S3)	1.14
11388	Transformer—First intermediate frequency transformer—(L16, L17, C24, C26)	1.90
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C27, C28, C29, R7, R8)	3.02
11804	Transformer—Power transformer—105-125 volts—25-50 cycles (T1)	6.02
11805	Transformer—Power transformer—105-130, 140-160, 195-250 volts—40-60 cycles (T1)	7.95
11667	Trap—Wave trap—(L1, C45)	1.22
13144	Volume control—(R11)	1.00
	REPRODUCER ASSEMBLIES	
	Speaker No. RL63-4 or RL70-1	
11232	Board—Terminal board with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil—(L22)	2.00
11233	Coil—Neutralizing coil (L20)	.30
11235	Cone—Reproducer cone—(L21)—(Speaker No. RL63-4)—Models 8T2 or 8T11	1.00
11258	Cone—Reproducer cone—(L21)—(Speaker No. RL70-1)—Model 8K11	1.00
5119	Connector—3-contact female connector for reproducer cable	.25
5118	Connector—3 contact male connector for reproducer	.25
9618	Reproducer—Complete (Speaker No. RL63-4)—Models 8T2 or 8T11	6.40
9619	Reproducer—Complete (Speaker No. RL70-1)—Model 8K11	6.05
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20
	Speaker No. 76365-1	
11836	Cone—Reproducer cone	1.75
5118	Connector—3-contact male connector for reproducer	.25
9634	Reproducer—Complete	$6.40
11837	Transformer—Output transformer (Field and hum coils are not removable)	1.56
	Speaker No. 76365-3	
11844	Coil—Field coil	2.00
11842	Coil—Hum neutralizing coil	.30
11838	Cone—Reproducer Cone	2.00
5118	Connector—3 contact male connector for reproducer	.25
9635	Reproducer—Complete	6.40
11839	Spring—Reproducer center support clamping spring—Package of 2	.30
11843	Transformer—Output transformer	1.56
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket and clamp	.22
12666	Cover—Reproducer cover—(Model 8K11)	.65
12698	Crystal—Station selector escutcheon and crystal—(Model 8T2)	1.02
13303	Crystal—Station selector escutcheon and crystal—(Model 8T11 or 8K11)	1.50
11276	Escutcheon—Tuning tube escutcheon—(Model 8T2)	.40
13275	Escutcheon—Tuning tube escutcheon (Model 8T11 or 8K11)	.25
11347	Knob—Range switch, tone control or volume control knob—Package of 5 (Model 8T2)	.75
11610	Knob—Station selector knob—includes one large and one small knob—Package of 5—(Model 8T2)	1.00
13304	Knob—Large station selector knob—Model 8T11 only—Package of 5	.75
13395	Knob—Large station selector knob—Model 8K11 only—Package of 5	.80
13305	Knob—Small (Vernier) Station selector knob—Model 8T11 only—Package of 5	.80
13396	Knob—Small (Vernier) Station selector knob—Model 8K11 only—Package of 5	.75
13306	Knob—Tone control, volume control or range switch knob—Model 8T11 only—Package of 5	.80
13278	Knob—Tone control, volume control or range switch knob—Model 8K11 only—Package of 5	.80
11210	Screw—Chassis mounting screw asembly for console model only—Package of 4	.28
11377	Screw—Chassis mounting screw assembly for table model only—Package of 4	.12
4982	Spring—Retaining spring for large knob in Stk. No. 11610, 13304 and 13395—Package of 10	.50
11349	Spring—Retaining spring for knob Stk. No. 11347, 13278, 13305, 13306, 13396 and small knob in Stk. No. 11610—Package of 5	.25

The prices quoted above are subject to change without notice.

SUPPLEMENT TO

RCA VICTOR MODELS 5T, 8T2, AND 8U

Model 5T (Speaker No. 72203-5)

On Model 5T, two different speakers are used which are readily identified by the following numbers stamped on them: (1) RL-63C1 and (2) 72203-5. Replacement parts for No. RL-63C1 are listed in the Service Data for Model 5T while the replacement parts for No. 72203-5 are listed below:

Stock No.	Description
9579	Coil - Field coil
9533	Cone - Reproducer cone mounted and centered in housing
5118	Connector - 3-contact male connector for reproducer
9578	Reproducer complete
4818	Transformer - Output transformer

Model 8T2 (Speaker No. RL-63E2)

On Model 8T2, four different speakers are used which are readily identified by the following numbers stamped on them: (1) RL-63-4, (2) 76365-1, (3) 76365-3, and (4) RL-63E2. Replacement parts for Nos. RL-63-4, 76365-1, and 76365-3 are listed in the Service Data for Model 8T2, while the replacement parts for No. RL-63E2 are listed below:

Stock No.	Description
12641	Board - Reproducer terminal board
12640	Bracket - Output transformer mounting bracket
11254	Coil - Field coil
11233	Coil - Hum neutralizing coil
12642	Cone - Reproducer cone and dust cap
5118	Connector - 3-contact male connector for reproducer
9773	Reproducer complete
11253	Transformer - Output transformer
11886	Washer - Spring washer to hold field coil securely

Model 8U (Motor No. 56992-1)

On Model 8U, two different motors are used which are readily identified by the following numbers stamped on the motor nameplate: (1) 72444-1 and (2) 56992-1. No. 72444-1 is an induction motor with a governor-type speed regulator while No. 56992-1 is a synchronous motor. Replacement parts for No. 72444-1 are listed in the Service Data for Model 8U while the replacement parts for No. 56992-1 are listed below:

Stock No.	Description
8989	Motor complete, 105-125 volts, 60 cycles
8993	Rotor and shaft for Stock No. 8989
3398	Spring - Motor mounting spring assembly
3817	Stud - Motor mounting stud

RCA VICTOR MODELS 8U and 8U2

Eight-Tube, Three-Band, A-C, Radio—Phonographs

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES
"Long Wave" (X) .... 155-320 kc
"Medium Wave" (A) .... 530-1,500 kc
"Short Wave" (C) .... 5,400-18,000 kc

ALIGNMENT FREQUENCIES
"Long Wave" (X) .... 175 kc (osc.), 300 kc (osc., det., ant.)
"Medium Wave" (A) .... 600 kc (osc.), 1,500 kc (osc., det., ant.)
"Short Wave" (C) .... 15,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT
(1) RCA-6K7 .... Radio-Frequency Amplifier
(2) RCA-6A8 .... First Detector—Oscillator
(3) RCA-6K7 .... Intermediate Amplifier
(4) RCA-6H6 .... Second Detector—A.V.C.
(5) RCA-6F5 .... Audio Voltage Amplifier
(6) RCA-6F6 .... Audio Power Amplifier
(7) RCA-5Z4 .... Full-Wave Rectifier
(8) RCA-6E5 .... Tuning Indicator

Pilot Lamps (3) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATING
Rating A .... 105-125 volts, 50-60 cycles, 135 watts
Rating B .... 105-125 volts, 25 cycles, 140 watts
Rating C .... 100-130/140-160/195-250 volts, 50-60 cycles, 135 watts

POWER OUTPUT RATING
Undistorted .... $2\frac{1}{4}$ watts
Maximum .... 5 watts

LOUDSPEAKER
Type .... Electrodynamic
Voice Coil Impedance ..... 2.25 ohms at 400 cycles

PHONOGRAPH
Type .... Manual
Turntable Speed (adjustable) .... 78 r.p.m.
Type of Pickup .... Low-impedance Magnetic
Pickup Impedance .... $8\frac{1}{2}$ ohms at 1,000 cycles

Mechanical Specifications

Height .... $43\frac{5}{8}$ inches
Width .... $24\frac{1}{4}$ inches
Depth .... $14\frac{3}{4}$ inches
Weight (net) .... 98 pounds
Weight (shipping) .... 150 pounds
Chassis Base Dimensions .... $13\frac{7}{8}$ inches x $7\frac{3}{4}$ inches x $2\frac{1}{2}$ inches
Over-all Chassis Height .... $7\frac{3}{4}$ inches

Operating Controls:
Radio .... (1) Volume, (2) Tuning, (3) Range Selector, (4) Power Switch—Tone
Phonograph .... (5) Radio–Record Transfer Switch, (6) Motor Switch
Tuning Drive Ratios .... 10 to 1 and 50 to 1

General Features

This Radio-Phonograph Combination consists of an eight-tube radio receiver and a manually-operated phonograph combined in one cabinet. The superheterodyne circuit is used with such features of design as improved antenna wave-trap, an r-f amplifier stage, all-metal tubes, aurally-compensated volume control, 3-position tone control with music-speech switch, automatic volume control, resistance-coupled audio system, tuning tube "Magic Eye," edge-lighted band indicator dial, and a dust-proof electrodynamic loudspeaker. A record storage compartment is located in the lower front of the cabinet. Trimming adjustments are located at accessible points. Their number is reduced to the least that is consistent with efficient operation. The tuning dial ratio of 10 to 1 with a 50 to 1 vernier permits ease of tuning, especially in the "Short wave" band.

Circuit Arrangement

The conventional superheterodyne type of circuit, consisting of an r-f stage, a combined first-detector—oscillator stage, a single i-f stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, an audio power-output stage, a high-voltage rectifier power-supply stage, and a tuning indicator "Magic Eye" stage, is used.

Tuned Circuits

The antenna coil system and the detector coil system each consist of two series-connected primary and three series-connected secondary windings to provide the three ranges of tuning. The oscillator coil system is wound on a single form. A range selector switch (S1) is used for connecting the various sections of these three coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable three-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for the "Medium wave" (A) band as well as the "Long wave" (X) band. A series trimmer is also associated with the "Medium wave" (A) and "Long wave" (X) band oscillator coils.

The intermediate-frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube (No. 1 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R8, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes through a suitable resistance filter circuit. The No. 2 diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R10 and R8, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio-voltage-amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first-audio stage and the power-output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High-frequency tone control is effected by a capacitor across the plate circuit of the output tube. Speech-music control is effected by a resistor connected to the compensated volume control circuit. Control of tone is obtained by means of the switch (S2).

Phonograph Circuit

The electrical impulses generated in the pickup L24 are boosted in the step-up transformer T3, after which they are applied to the grid of the RCA-6F5 audio amplifier stage through the compensated phonograph volume control R27. This phonograph volume control also incorporates switches for transferring from radio to record reproduction. In the radio position, arm "X" of the phonograph volume control contacts lug "Y" which completes the audio circuit from the radio volume control R11 to the grid of the RCA-6F5 audio amplifier; also, switch S5 closes which completes the cathode circuit of the RCA-6K7 i-f amplifier stage. In the phonograph position, switch S5 opens and arm "X" of the phonograph volume control disconnects from lug "Y" and moves onto the phonograph volume control resistance as shown by figure 2.

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. Correct tuning of the receiver to the incoming carrier is evidenced by the minimum width of the dark sector of the tuning tube.

Rectifier

The power required for operation of this receiver is supplied through transformer T1. This transformer has an efficient electrostatic shield between its primary and secondary windings. This shield prevents interference which is on the power-supply circuit from entering the receiver and conversely reduces the tendency of the receiver to re-radiate into the power circuit. An RCA-5Z4 furnishes the d-c voltages necessary for plate, screen, cathode, and grid potentials. The field winding of the loudspeaker is used as a reactor in the filter circuit from which it simultaneously receives its magnetizing current.

Phonograph Mechanism

An improved manually-operated phonograph mechanism is used in this model. The 12-inch turntable will accommodate either the 10-inch or the 12-inch phonograph records. The turntable rotates at a speed of 78 r.p.m. A speed regulator is provided for accurate adjustment of this speed. *It is important that a machine of any particular rating be operated at the frequency and voltage for which it is rated.* Attempts to operate at ratings other than specified for the particular instrument may result in damage to both the phonograph motor and the radio receiver. An automatic switch is provided to turn "off" the phonograph motor at the completion of record play when the eccentric-type inside groove record is used.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to locate causes for defective operation if such develops. Values of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R30, L1, C45, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the

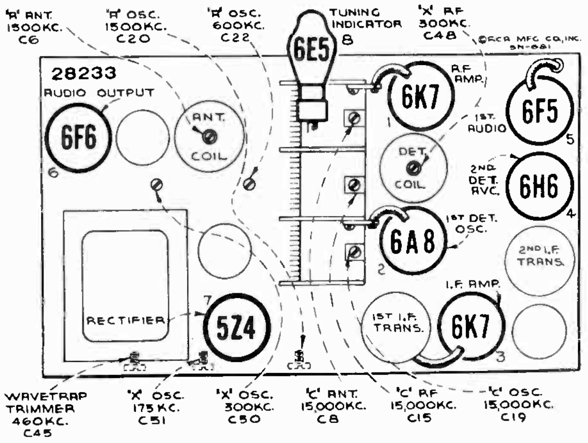


Figure 1—Radiotron, Coil, and Trimmer Locations

schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, five in the oscillator coil system, three in the detector coil system, and three in the antenna coil system. Each of these trimmers has been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality, and poor selectivity. These indications will generally be present together.

The correct performance of this receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus and in the sequence given. The manufacturer of this instrument has a complete assortment of such service equipment available for sale through its dealers and distributors.

Two methods of alignment are applicable. One method requires the cathode-ray oscillograph, while the other requires a voltmeter or glow-type indicator. The oscillographic method is advantageous in that the indication is in the form of a wave-image which represents the resonance characteristic of the tuned circuits. Alignment by this method should be performed with equipment such as an **RCA Stock No. 9545 Cathode-Ray Oscillograph** and an **RCA Stock No. 9558 Frequency Modulator.** For the output indicator method, an instrument such as an **RCA Stock No. 4317** should be used. Either of the above methods requires a reliable test oscillator for the source of alignment frequencies such as the **RCA Stock No. 9595 Test Oscillator.** Cathode-ray alignment is similar to the output indicator alignment outlined below, except as follows: The frequency modulator should be used to sweep the test oscillator signal when aligning the i-f amplifier and the low-frequency oscillator series trimmers. It will only be necessary to first adjust the trimmers to peak response, as outlined below, without the frequency modulator connected. Then, interconnect the test oscillator with the frequency modulator and re-tune the test oscillator (increase frequency) until the forward and reverse curves coincide at their highest points. Next, adjust the trimmers until the curves coincide throughout their length and have maximum amplitude. The proper place for connection of the oscillograph input to the receiver is indicated on the Chassis Wiring Diagram (figure 3). The high-frequency trimmers on all three bands should be adjusted for maximum (peak) amplitude of the images.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by figure 5. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice-coil circuit. Attach the receiver chassis to a good external ground. Connect the output of the test oscillator between the control-grid of the RCA-6A8 first-detector tube and chassis-ground through a **.001 mfd.** capacitor. Tune the test oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point where no interference is encountered from broadcast stations, or short stator of oscillator tuning capacitor **C18** to chassis eliminating local oscillator signals. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Adjust the two trimmers, **C28** and **C27** of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers, **C26** and **C24**, of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test-oscillator output so that the receiver output indication is always as low as possible. By doing so, broadness of tuning, due to a.v.c., action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the inter-action between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The eleven trimmers associated with the r-f, first detector, and oscillator tuned circuits have their locations shown by figures 1 and 5. The three trimmers which are at all times directly in shunt with the

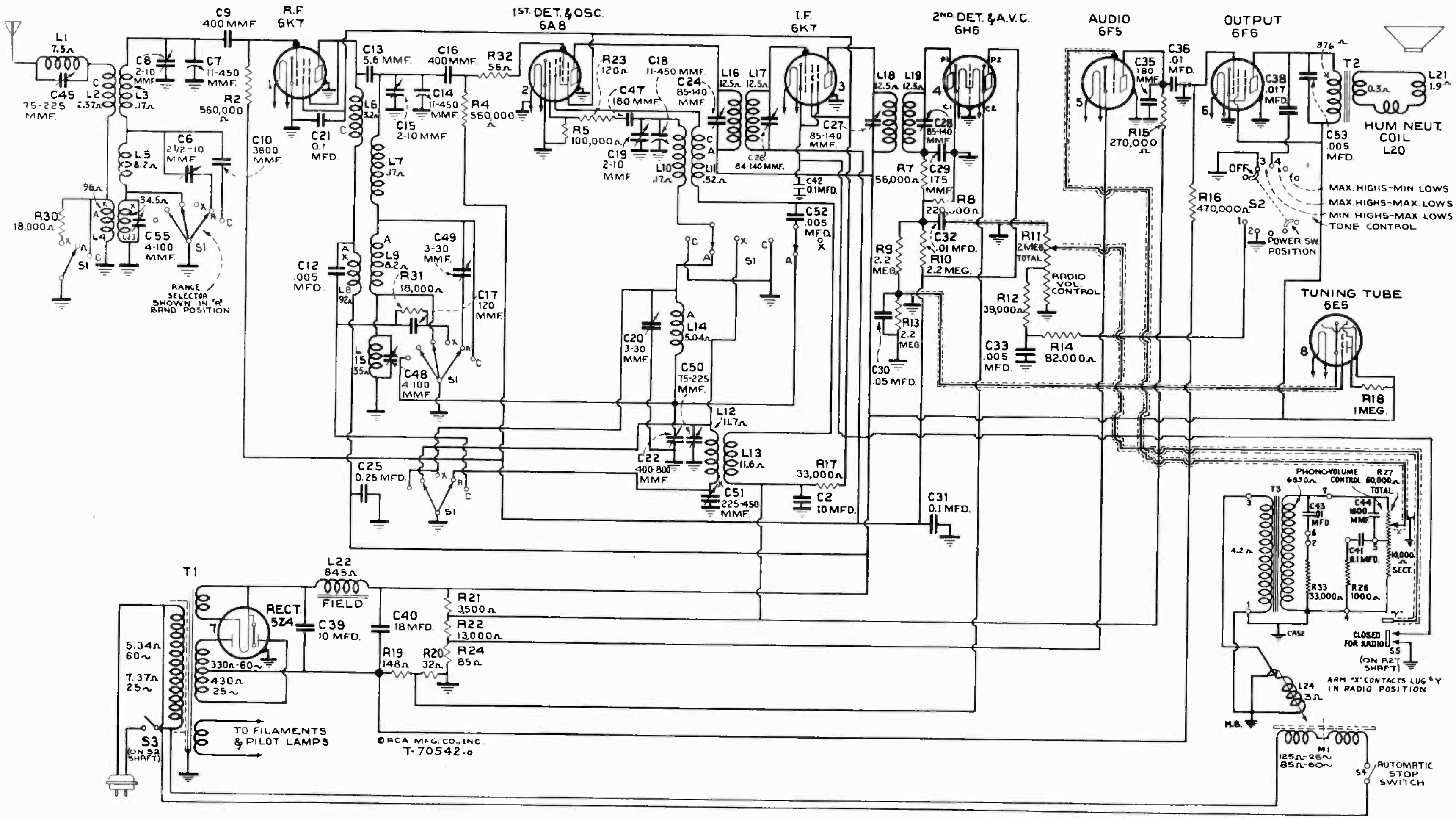


Figure 2—Schematic Circuit Diagram

SERVICE HINT

Excessive heating of the 6E5 tube may be due to high cathode current — in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

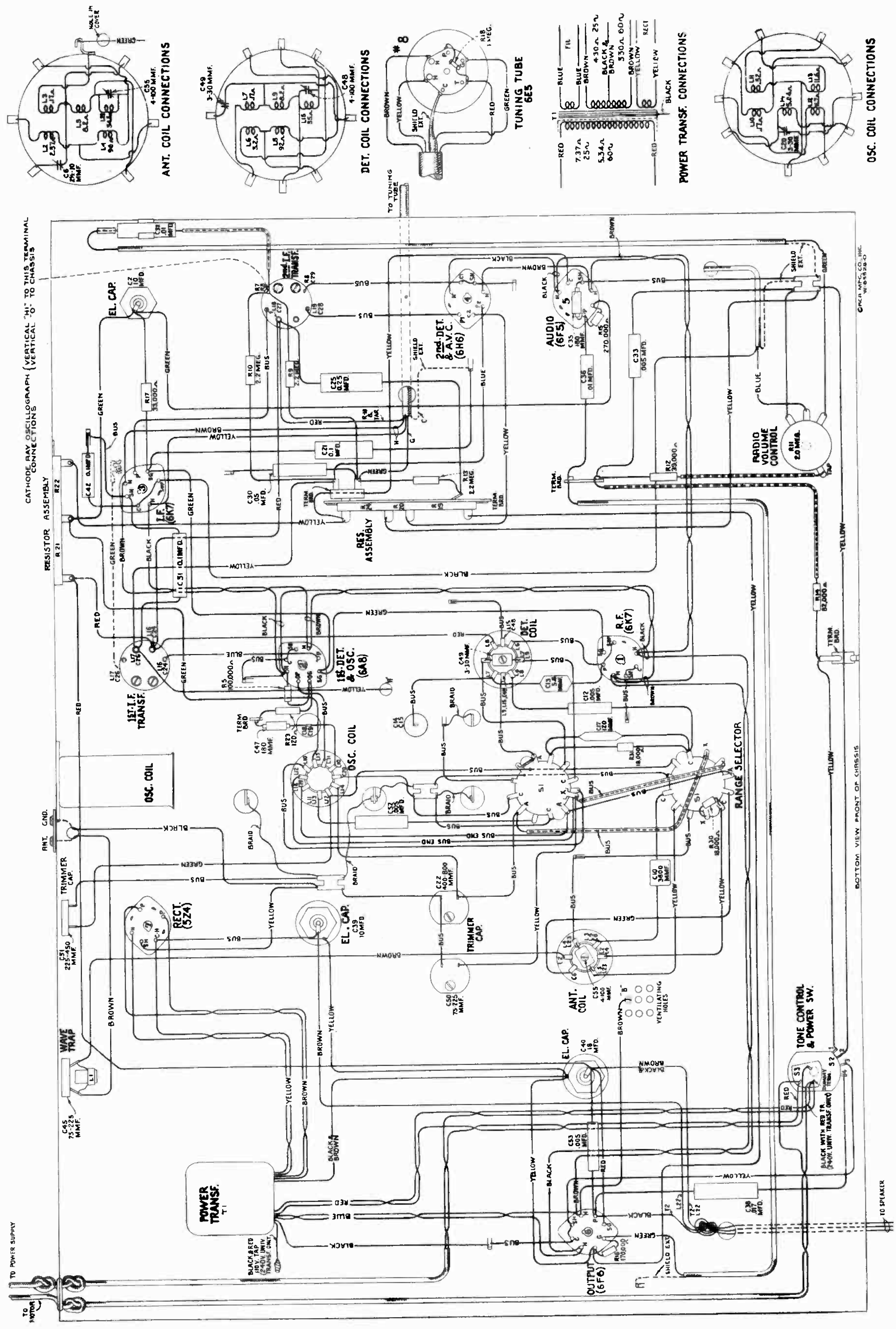


Figure 3—Chassis Wiring Diagram

variable tuning condensers necessitate that the "Short wave" (C) band be aligned first. The range selector switch should, therefore, be turned to its "Short wave" position for the first adjustments. Leave the output indicator connected to the output system.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full-mesh (maximum capacity) position and adjust the dial pointer so that its end points to the **horizontal** graduation (**520 kc**) at the low-frequency end of the "Medium wave" (A) dial scale.

Wave-Trap Adjustment

Connect the test oscillator to the antenna and ground terminals of the receiver, leaving it tuned to **460 kc.** Adjust the wave-trap trimmer **C45** for maximum suppression of the **460 kc** signal. An increase in test-oscillator output may be necessary before the point of minimum output (maximum suppression of signal) is obtained.

"Short Wave" Band

(a) Adjust the test oscillator to **15,000 kc** and set the receiver tuning control to a dial reading of **15,000 kc.**

(b) Adjust trimmer **C19** on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of **maximum trimmer capacitance** is correct and should be used. The local (heterodyne) oscillator will be **460 kc** below the signal frequency at this adjustment point.

(c) Adjust trimmer **C15** of the detector section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **15,000 kc** input signal, until maximum receiver output results from these combined operations.

(d) With the receiver tuning control set to **15,000 kc** adjust trimmer **C8** on the antenna section of the variable condenser to the point which produces maximum (peak) indicated receiver output.

"Medium Wave" Band

(e) Change the receiver range selector to its "Medium wave" (A) band position and set

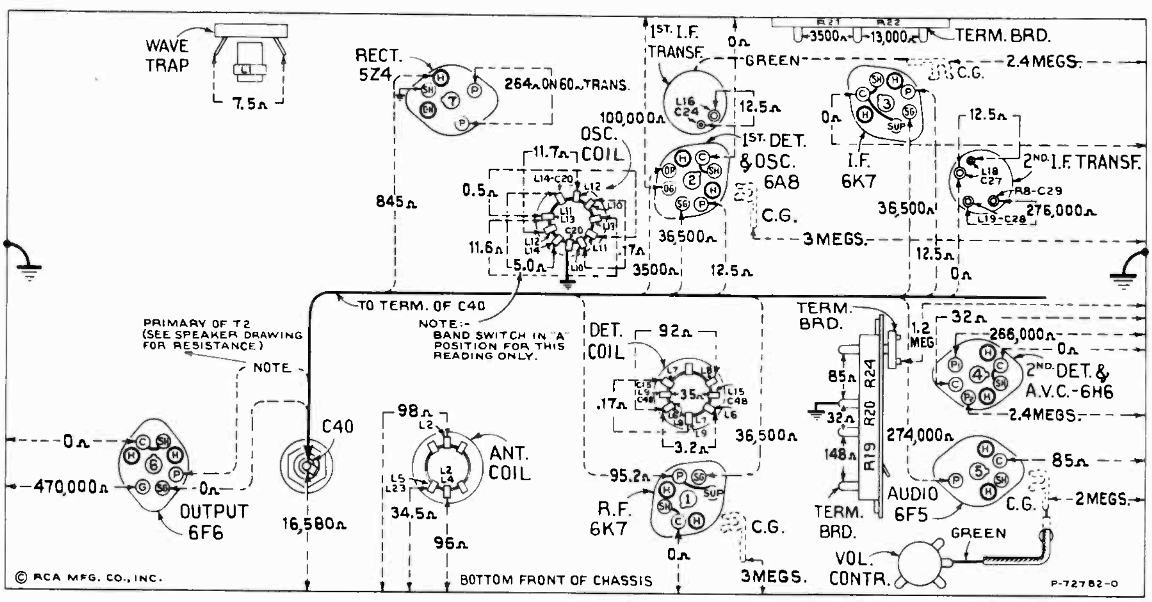


Figure 4—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Long wave" position—Volume control maximum—Power switch–Tone in "OFF" position—Radio–Record switch to "Radio"

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 4, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagram, figure 3, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm$ 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

the receiver tuning control to a dial reading of **1,500 kc.** Tune the test oscillator to **1,500 kc** and regulate its output to produce a slight indication on the receiver output indicating device.

(f) Adjust the high-frequency trimmers of the oscillator, detector, and antenna coils, **C20, C49,** and **C6** respectively, to the points at which each produces maximum indicated receiver output.

(g) Shift the test-oscillator frequency to **600 kc** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(h) Adjust the low-frequency trimmer **C22** of the oscillator coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of **C19, C15,** and **C8** should be corrected at **15,000 kc** as in (b), (c), and (d); also **C20, C49,** and **C6** should be corrected at **1,500 kc,** as in (f) to compensate for any changes caused by the adjustment of the low-frequency oscillator coil trimmer **C22.**

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1) RCA-6K7—R-F	12.5 ma.
(2) RCA-6A8—Det.-Osc.	13.8 ma.
(3) RCA-6K7—I.F.	9.0 ma.
(4) RCA-6H6—2nd Det.-A.V.C.	—
(5) RCA-6F5—Audio	0.25 ma.
(6) RCA-6F6—Power	40.0 ma.
(7) RCA-5Z4—Rect.	90.0 ma.*
(8) RCA-6E5—Eye	3.0 ma.

(* Cannot be measured at socket.)

"Long Wave" Band

(i) Change receiver band selector to "Long wave" (X) band and set receiver tuning control to a dial reading of **300 kc.** Tune test oscillator to **300 kc** and adjust oscillator, detector, and antenna trimmers **C50, C48,** and

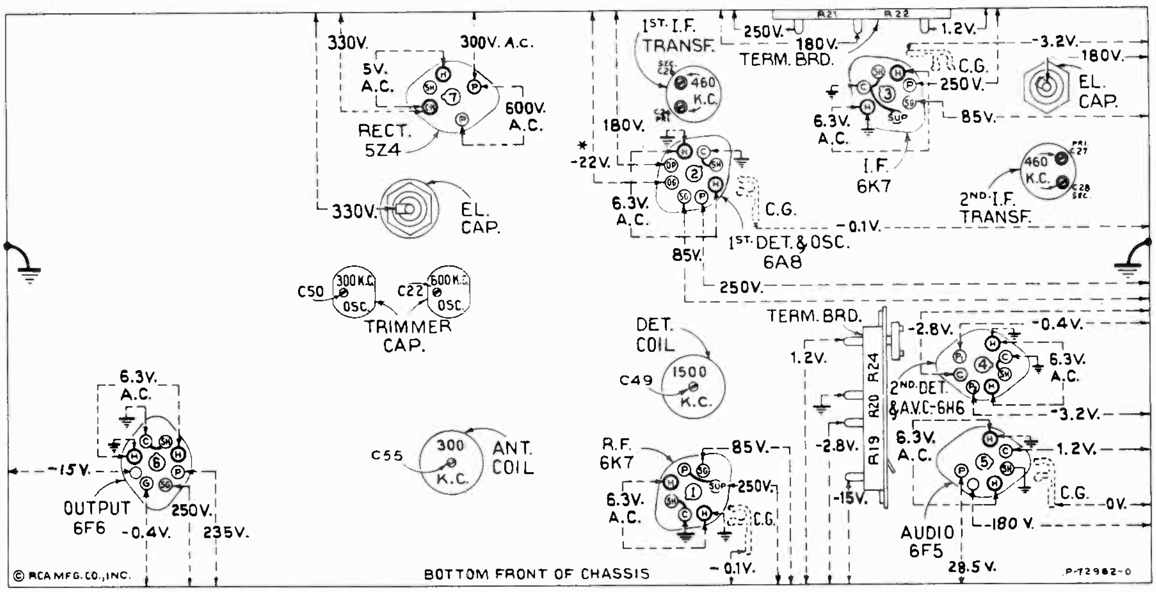


Figure 5—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Power switch–Tone full clockwise—Radio–Record switch to "Radio"

Radiotron Socket Voltages

Note: The asterisk (*) value may vary appreciably.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 5 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000 ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1.000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

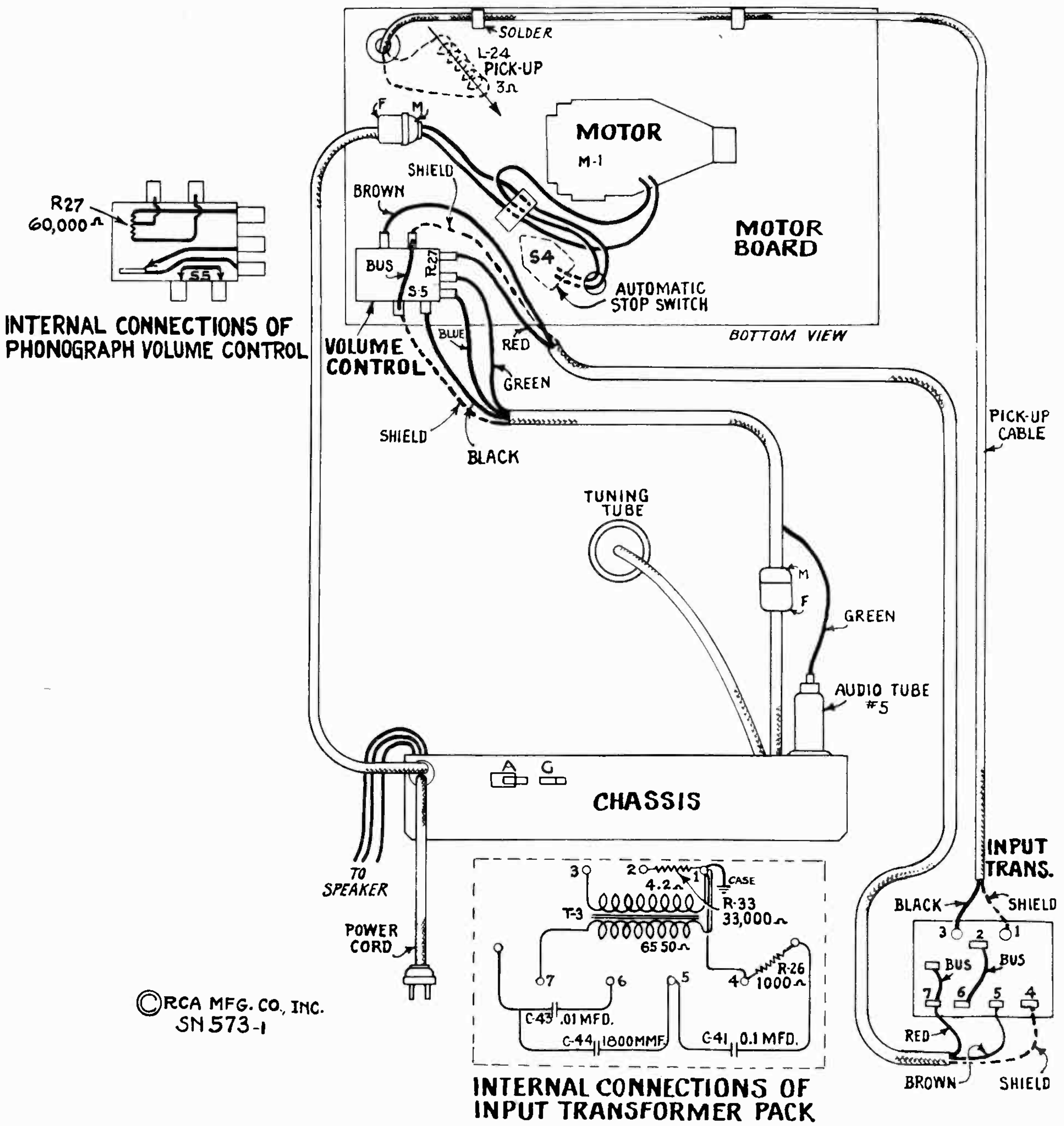


Figure 6—Assembly Wiring

C55, respectively, for maximum indicated receiver output.

(j) Set receiver to 175 kc and tune test oscillator to 175 kc. Adjust trimmer C51 for maximum indicated output, simultaneously rocking tuning control of the receiver backward and forward through the signal.

(k) The adjustment of C50, C48, and C55 should now be repeated at 300 kc as described in (i) to compensate for any changes caused by the adjustment of the low-frequency trimmer C51.

Phonograph Mechanism

The phonograph motor is of the governor induction type and designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 8. Application of oil to the felt pad which rubs against the governor disc will insure smooth operation.

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

Centering Armature

Refer to figure 7 showing the pickup inner structure. The armature is shown in its proper relation to

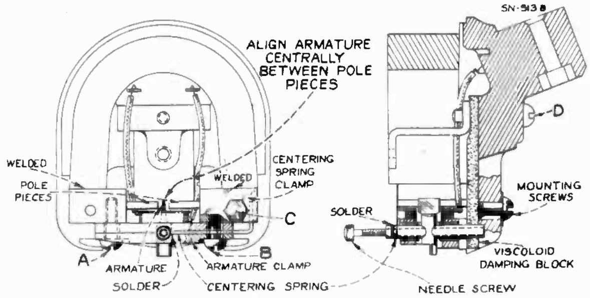


Figure 7—Details of Pickup

the magnet pole pieces, i. e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical

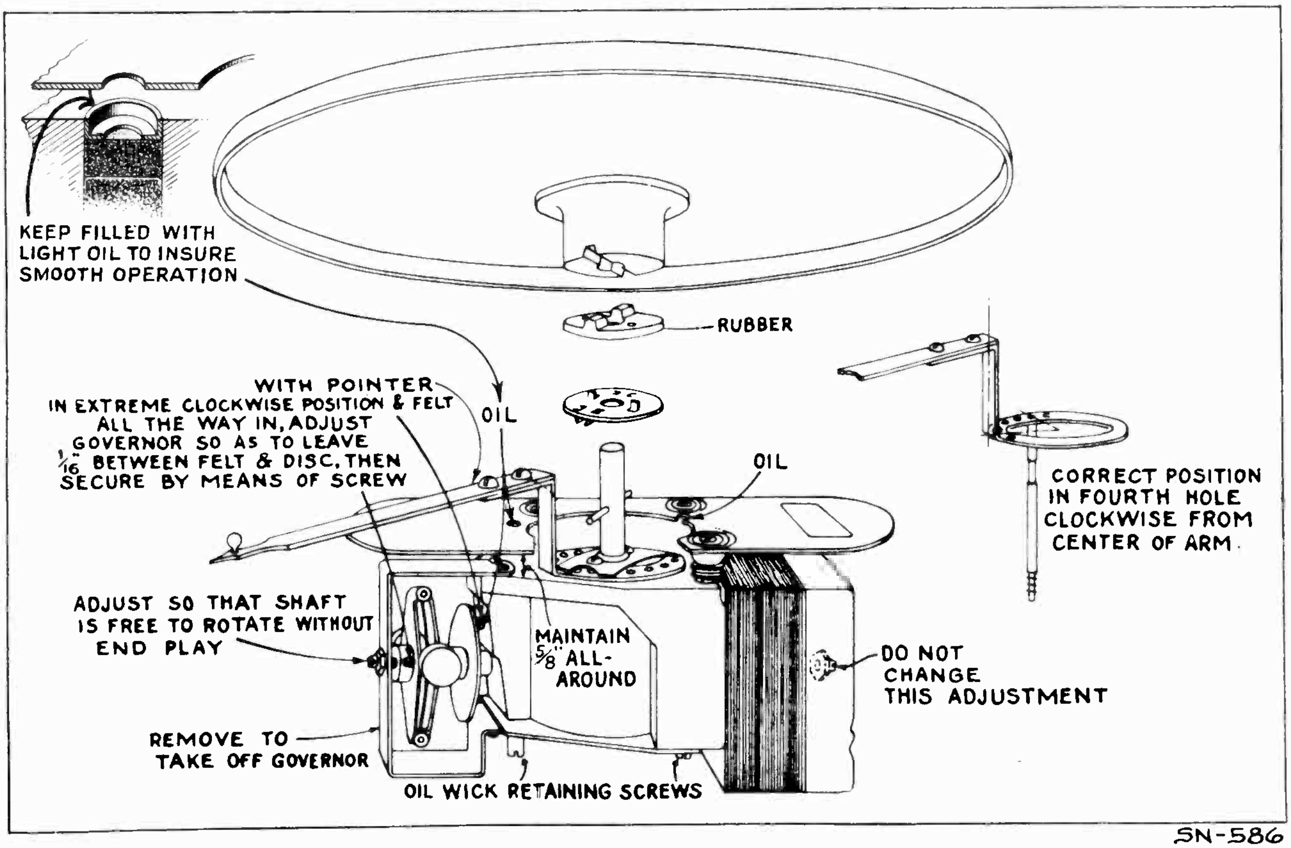


Figure 8—Motor Details

axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly

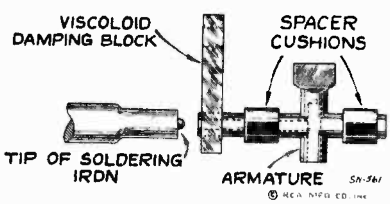


Figure 9—Special Soldering-Iron Tip

cleaned with fine emery cloth. Then insert the new block so that it occupies the same position as it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in figure 9 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to re-adjust the armature as previously explained after re-assembly of the mechanism. Only rosin core solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone, using care not to allow the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

Universal Transformer

The transformer used on some models of this receiver is adaptable to several ranges of voltage as given under Rating C of Electrical Specifications. Its schematic and wiring are shown by figure 11. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage being used. Note that a 110-volt tap is brought out separately for supplying a phonograph motor.

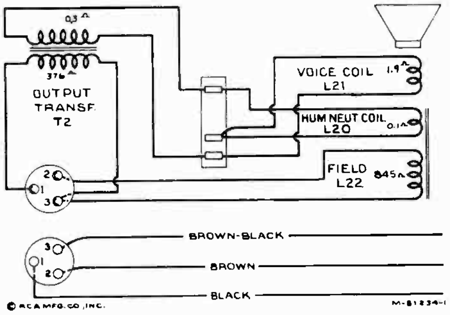
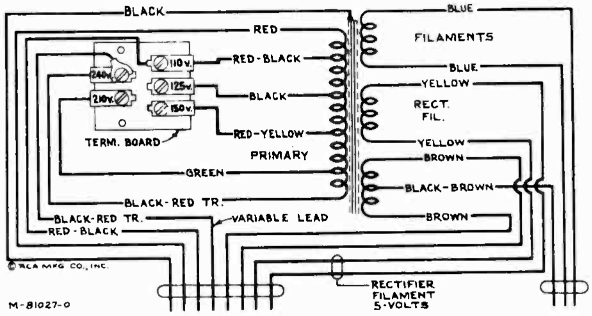


Figure 10—Loudspeaker Wiring



Primary resistance—10.5 ohms total
Secondary resistance—265 ohms total

Figure 11—Universal Transformer

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
12706	Arm—Arm and hub assembly for operating shutter	$0.22
13098	Board—Antenna and ground terminal board	.25
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	.43
11625	Cable—Radiotron tuning tube cable complete with socket	1.26
11759	Cable—2-conductor shielded volume control cable—complete with 4-contact female connector	.92
12511	Cap—Contact cap—Package of 5	.15
11465	Capacitor—Adjustable trimmer (C22)	.48
11256	Capacitor—Adjustable trimmer (C50)	.48
4955	Capacitor—Adjustable trimmer (C45)	.48
12065	Capacitor—Adjustable trimmer (C51)	.65
12814	Capacitor—5.6 Mmfd.—(C13)	.20
12974	Capacitor—120 Mmfd.—(C17)	.20
5116	Capacitor—175 Mmfd.—C29)	.18
13003	Capacitor—180 Mmfd.—(C35, C47)	.20
11290	Capacitor—400 Mmfd.—(C9, C16)	.25
11621	Capacitor—3,600 Mmfd.—(C10)	.38
4868	Capacitor—.005 Mfd.—(C12, C33, C52, C53)	.20
11451	Capacitor—.017 Mfd.—(C38)	.18
11395	Capacitor—.01 Mfd.—(C32)	.18
4858	Capacitor—.01 Mfd.—(C36)	.25
4839	Capacitor—0.1 Mfd.—(C21)	.28
4841	Capacitor—0.1 Mfd.—(C31)	.22
11414	Capacitor—0.1 Mfd.—(C42)	.20
5170	Capacitor—0.25 Mfd.—(C25)	.25
4836	Capacitor—.05 Mfd.—(C30)	.30
11240	Capacitor—10 Mfd.—(C39)	1.08
11387	Capacitor—10 Mfd.—(C2)	.86
5212	Capacitor—18 Mfd.—(C40)	1.16
12061	Coil—Antenna coil—Less shield—(L2, L3, L4, L5, L23, C6, C55)	1.90
12062	Coil—Detector coil—Less shield—(L6, L7, L8, L9, L15, C48, C49)	1.94
12063	Coil—Oscillator coil—Less shield—(L10, L11, L12, L13, L14, C20)	2.62
12965	Condenser—Three-gang variable tuning condenser—(C7, C8, C14, C15, C18, C19)	6.15
4153	Connector—4-contact female connector for volume control cable	.48
4573	Connector—2-contact female connector for motor cable	.30
13094	Dial—Station selector dial scale	1.05
11394	Foot—Chassis foot assembly—Package of 2	$0.70
12712	Indicator—Station selector indicator pointer	.22
5226	Lamp—Dial lamp—Package of 5	.70
12718	Mask—Dial Light Diffuser with colored screen	.40
11393	Resistor—Voltage divider resistor—comprising one 3,500 ohm and one 13,000 ohm sections—(R21, R22)	.74
11329	Resistor—Voltage divider resistor— comprising one 148 ohm, one 32 ohm and one 85 ohm sections—(R19, R20, R24)	.52
12075	Resistor—56 ohms—Flexible type complete with contact cap—(R32)	.28
12071	Resistor—120 ohms—Carbon type—¼ watt—(R23)—Package of 5	1.00
12070	Resistor—18,000 ohms—Carbon type—1/10 watt—(R30, R31)—Package of 5	.75
5033	Resistor—33,000 ohms—Carbon type—1 watt—(R17)—Package of 5	1.10
11322	Resistor—39,000 ohms—Carbon type—¼ watt—(R12)—Package of 5	1.00
11365	Resistor—82,000 ohms—Carbon type—¼ watt—(R14)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—(R5)—Package of 5	1.00
11453	Resistor—270,000 ohms—Carbon type—1/10 watt—(R15)—Package of 5	.75
11452	Resistor—470,000 ohms—Carbon type—1/10 watt—(R16)—Package of 5	.75
11397	Resistor 560,000 ohms—Carbon type—1/10 watt—(R2, R4)—Package of 5	.75
12013	Resistor—1 megohm—Carbon type—1/10 watt—(R18)—Package of 5	.75
11626	Resistor—2.2 megohms—Carbon type—¼ watt—(R9, R10, R13)—Package of 5	1.00
4669	Screw—No. 8-32 set screw for arm Stk No. 12706—Package of 10	.25
12064	Shield—Antenna or detector coil shield	.28
11604	Shield—Oscillator coil shield	.24
11390	Shield—Intermediate frequency transformer shield	.25
12735	Shield—Dial lamp shield—Package of 5	.25
12971	Shutter—Dial scale holder and shutter assembly	.85
11222	Socket—Dial lamp socket	.18
11195	Socket—5-contact rectifier Radiotron socket	.15

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
11198	Socket—7-contact 6K7—6F5—or 6H6 Radiotron socket	.15
11196	Socket—8 contact 6A8 or 6F6 Radiotron socket	.15
12849	Spring—Tension spring shutter—Package of 5	.18
12966	Switch—Range switch—(S1)	1.75
11392	Switch—Tone control and power switch assembly—(S2, S3)	1.14
11388	Transformer—First intermediate frequency transformer—(L16, L17, C24, C26)	1.90
11389	Transformer—Second intermediate frequency transformer—(L18, L19, C27, C28, C29, R7, R8)	3.02
11803	Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)	4.38
11805	Transformer—Power transformer—105-130, 140-160, 195-250 volts—40-60 cycles (T1)	7.95
11667	Trap—Wave trap—(L1, C45)	1.22
13144	Volume control—(R11)	1.00
	MOTOR ASSEMBLIES	
11703	Governor—Governor complete for phonograph motor—Stock No. 11701 or No. 11702	3.05
11701	Motor—Phonograph turntable motor—110 volts—50 to 60 cycles—(M1)	21.20
	MOTOR BOARD ASSEMBLIES	
4594	Box—Used needle box (cup)	.30
4577	Connector—2-contact male connector for motor cable	.30
7084	Cover—Turntable cover	.40
11704	Damper—Turntable rubber damper and damper plate	.24
4596	Escutcheon—Speed regulator escutcheon plate	.36
4597	Screw—Motor mounting screw assembly—comprising four screws, four lockwashers, four spacers, and four nuts	.22
11696	Turntable—Complete	2.48
11695	Volume control—Phonograph volume control—(R27, S5)	1.60
	ECCENTRIC AUTOMATIC BRAKE SWITCH ASSEMBLIES	
3994	Cover—Eccentric automatic switch cover and screw	.26
10174	Springs—Automatic brake springs—comprising one each of four springs—Package of 2 sets	.50
6896	Switch—Eccentric automatic brake and switch assembly—less switch cover	2.50
3322	Switch—Eccentric automatic switch only—less cover—(S13)	.75
	PICKUP AND ARM ASSEMBLIES	
11944	Arm—Pickup arm complete—less pickup unit	6.00
13404	Armature—Pickup armature	.95
11548	Back—Pickup housing back	.52
11946	Coil—Pickup coil—(L24)	.65
3521	Cover—Pickup back cover	.18
11708	Cover—Pickup front cover	.15
12354	Damper—Pickup damper	.16
3516	Damper—Pickup arm damper—comprising one upper and one lower damper, one upper bushing and one lower bearing	.14
3390	Escutcheon—Pickup arm escutcheon	.46
11945	Pickup unit—Complete—(L24)	5.50
3389	Rod—Eccentric automatic brake trip rod—Package of 5	$0.40
3387	Screw assembly—Pickup mounting screw assembly—comprising one screw, one lockwasher and one nut—Package of 10	.50
11549	Screw—Pickup front cover screw—Package of 10	.42
11547	Screw—Pickup needle holding screw—Package of 10	.42
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil—(L22)	2.00
11233	Coil—Neutralizing coil (L20)	.30
11258	Cone—Reproducer cone—(L21)	1.00
5118	Connector—3 contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9619	Reproducer—Complete	6.05
11253	Transformer—Output transformer—(T2)	1.56
11886	Washer—Spring washer used to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket and clamp	.22
11947	Cable—2-conductor shielded cable, approximately 35 inches long—connects volume control to input transformer	.85
11948	Cable—3-conductor shielded volume control cable (control end)—complete with 4-contact male connector	1.50
6123	Connector—4-contact male connector for volume control cable	.30
12698	Crystal—Station selector escutcheon and crystal	1.02
11276	Escutcheon—Tuning tube escutcheon	.40
11347	Knob — Phonograph volume control, radio volume control, range switch, or tone control and power switch knob—Package of 5	.75
11610	Knob—Station selector knob assembly, comprising one large and one small knob—Package of 5	1.00
12556	Receptacle—Needle holder	.40
11210	Screw—Chassis mounting screw assembly—Package of 4	.28
11349	Spring—Retaining spring for knob Stk. No. 11347, and small knob in Stk. No. 11610—Package of 5	.25
4982	Spring—Retaining spring for large knob in Stk. No. 11610—Package of 10	.50
3391	Spring—Suspension spring and washer assembly for mounting motor board, comprising 1 bolt, 1 top spring, 1 bottom spring, 2 cup washers, 1 C washer and 1 cap nut	.50
11949	Transformer—Phonograph input transformer pack, comprising one input transformer, one 1,800 Mmfd., one .01 Mfd. and one 0.1 Mfd. capacitors and one 1,000-ohm, one 33,000-ohm resistors (T3, C41, C43, C44, R26, R33)	7.05

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 9K

Nine-Tube, Four-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X) .... 150-410 kc

"Standard Broadcast" (A) .... 530-1,800 kc

"Medium Wave" (B) .... 1,800-6,400 kc

"Short Wave" (C) .... 6,400-23,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X) .... 175 kc (osc.), 350 kc (osc., det., ant.)

"Standard Broadcast" (A) .... 600 kc (osc.), 1,500 kc (osc., det., ant.)

"Medium Wave" (B) ... 6,000 kc (osc., det., ant.)

"Short Wave" (C) .... 20,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6K7 .... R-F Amplifier
(2) RCA-6J7 .... Oscillator
(3) RCA-6L7 .... First Detector
(4) RCA-6K7 .... I-F Amplifier
(5) RCA-6H6 .... Second Detector and A.V.C.
(6) RCA-6F5 .... Audio Voltage Amplifier
(7) RCA-6F6 .... Power Output
(8) RCA-5Z4 .... Full-Wave Rectifier
(9) RCA-6E5 .... Tuning Tube

Pilot Lamps (4) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A .... 105-125 volts, 50-60 cycles, 95 watts
Rating B .... 105-125 volts, 25-60 cycles, 95 watts
Rating C .... 100-130/140-160/195-250 volts, 40-60 cycles, 95 watts

POWER OUTPUT

Undistorted .... 2 watts
Maximum .... 4.5 watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (v.c.) .... 2.2 ohms at 400 cycles

Mechanical Specifications

Height .... 40½ inches
Width .... 27 inches
Depth .... 14 inches
Weight (net) .... 56 pounds
Weight (shipping) .... 86 pounds
Chassis Base Dimensions .... 14½ inches x 7¾ inches x 3¼ inches
Over-all Height of Chassis .... 9 inches
Operating Controls. (1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Tone
Tuning Drive Ratios .... 20 to 1 and 100 to 1

General Description

This receiver represents the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model 9K is a nine-tube, console-type, superheterodyne receiver with a twelve-inch electrodynamic loudspeaker. Design features incorporated in this receiver include a built-in doublet antenna coupler; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; two-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof electrodynamic loudspeaker.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave" and "Short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, a first-detector (converter) stage, a separate oscillator stage, an i-f amplifier stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, a power-amplifier stage, a tuning indicator "Magic Eye," and a full-wave rectifier.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7 r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

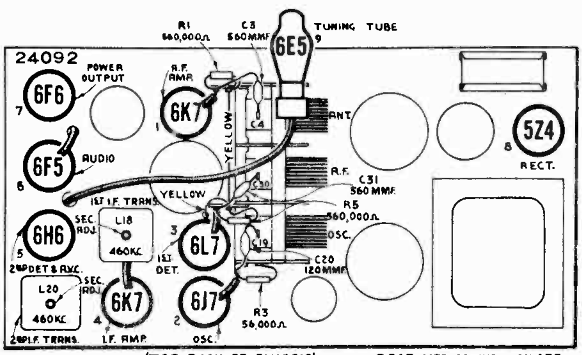


Figure 1—Radiotron and I-F Trimmer Locations

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L11 and L16 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L15, L14, L13, and L12 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L15. L16 acts as the primary which transfers energy to the secondary L15. Capacitor C24 resonates primary L16 at the proper frequency. In the "Standard broadcast" (A) band L14, L13, and L12 are connected in series as the secondary circuit. The ground of the coil system is now between L15 and L14. L15 is used as the primary and is resonated at the proper frequency by capacitors C28 and C29 which are in shunt with this coil. Capacitor C24 is connected to transfer energy to the primary coil L15. In the "Medium wave" (B) band, L13 and L12 are connected in series as the secondary. The ground of the coil system is now between L14 and L13. L14 is used as the primary and is resonated at the proper frequency by capacitor C29 which is in shunt with this coil. L15 is shorted by the range selector. Capacitor C24 transfers the r-f energy from the plate circuit to the primary L14. In the "Short wave" (C) band, L12 is the secondary. The ground of the coil system is now between L13 and L12. L13 is used as the primary and is resonated to the proper frequency by capacitor C29. In addition, L11 acts as a high-frequency primary which resonates at about 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L15 and L14 are shorted by the range selector.

Separate windings are employed in the oscillator stage for each position of the range selector. The inherent stability of this circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to control grid No. 2 of the RCA-6L7 first detector.

I-F Amplifier

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R11 and R12, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The other (auxiliary) diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R10, R11, and R12, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6F5 audio voltage-amplifier tube. This control has a two-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6F6 power-output tube. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S4 which, in the "Speech" position, places an additional capacitor C45 in shunt with the capacitor C44 in one of the tone compensating filters. This reduces the low-frequency response of the amplifier and provides maximum intelligibility of the voice frequencies.

Continuously variable tone control is effected by means of capacitor C48 and variable resistor R19 shunting the plate circuit of the output tube.

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. A portion of the signal voltage developed across resistor R12 is used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by the minimum width of the dark sector on the fluorescent screen.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are fourteen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and four adjustments for the i-f system. Twelve of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining seven adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

This receiver requires a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instrument will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 5. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the oscillator, detector, and r-f circuits, the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads Prior to Alignment
(Refer to Figure 3)

Band "X"

1. Keep blue lead X of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead of S1 to antenna coil L5-6.
2. Keep blue lead X of S3 to detector coil L14-15 clear of chassis, coil shield, coil, and other leads.
3. Keep bus lead C5 to X of S1 apart from bus lead C6 to A of S1, and from chassis.

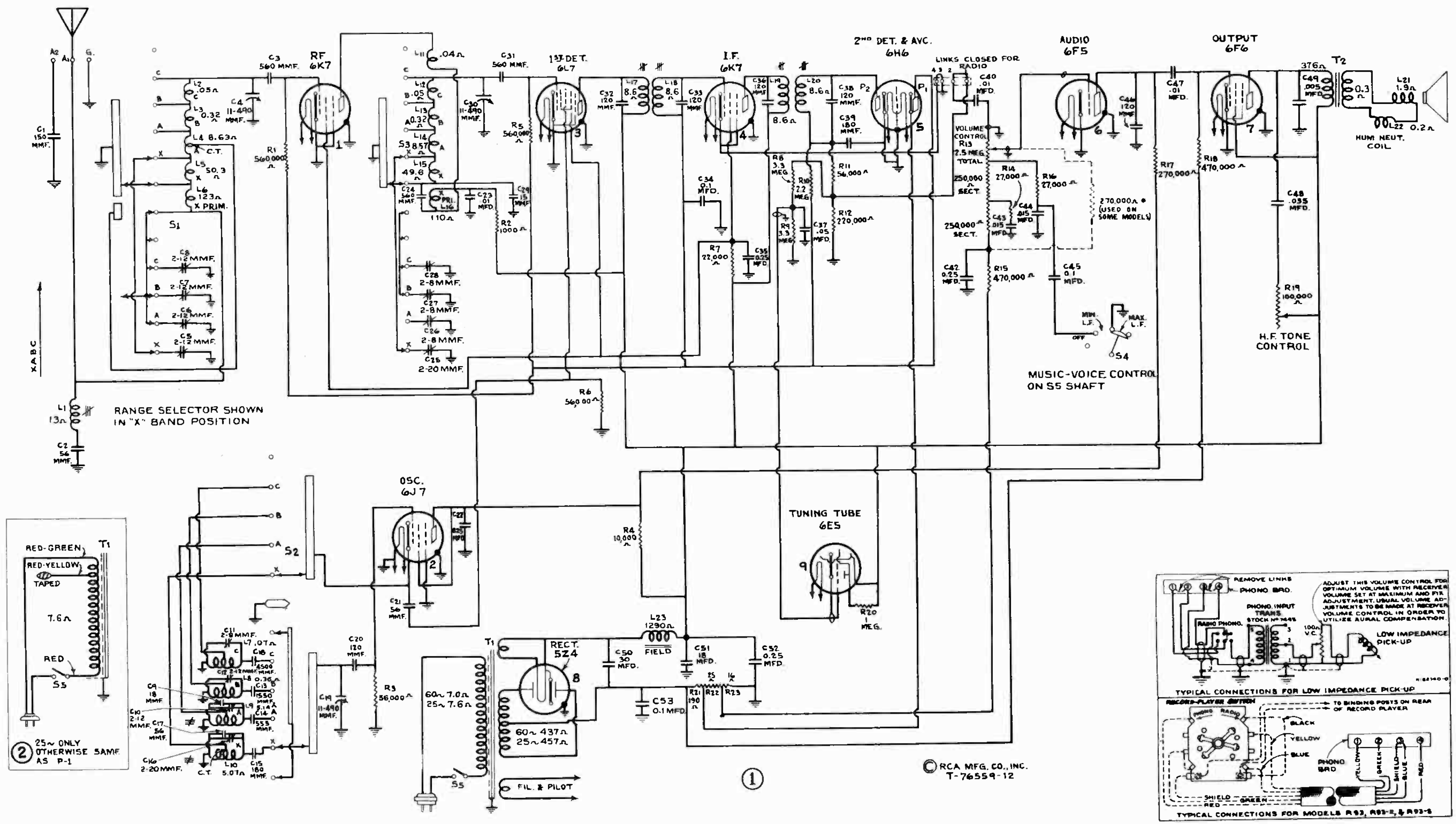
Band "A"

1. Keep green lead, terminal of S1 to antenna coil tap L-4, away from chassis, coil shield, and coil.
2. Keep bus lead C6 to A of S1 apart from bus lead C5 to X of S1, and from chassis.

Band "C"

Lead from C18 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**



SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) If low end of range is dead, exchange 6L7 tube and reduce R-6 and R-3 to 33,000 ohms each.

(3) Value of C-20, 120 mmfd. is critical and must be held exact to prevent regeneration on "C" band.

Figure 2—Schematic Circuit Diagram

(* 270,000-ohm resistor not required when replacing volume control with Stk. No. 12861)

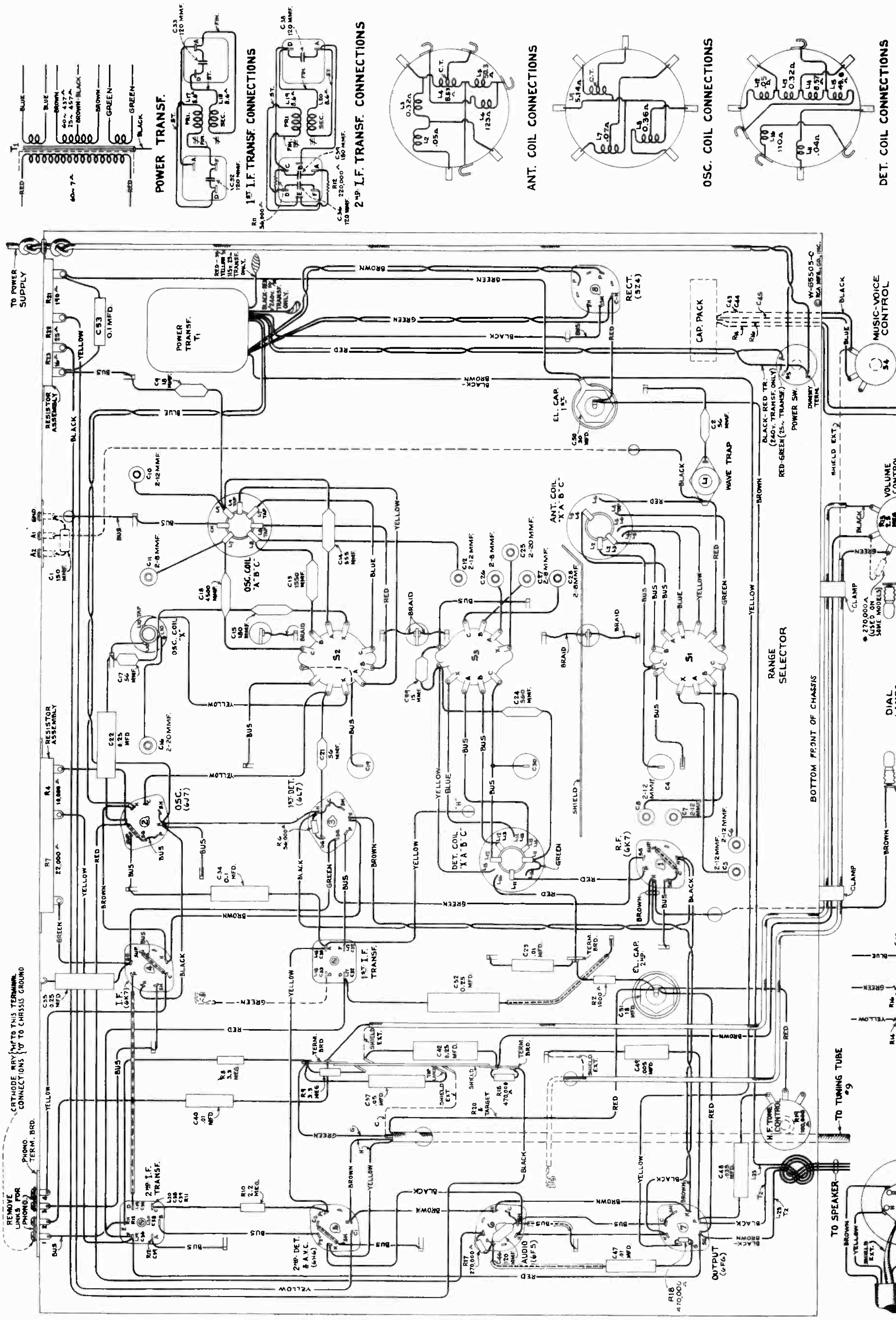


Figure 3—Chassis Wiring Diagram

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 5. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are **920 kc** apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency **460 kc** below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** The output-indicator method should be performed with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator.** Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.** Both of these procedures are outlined below.

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 4. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The

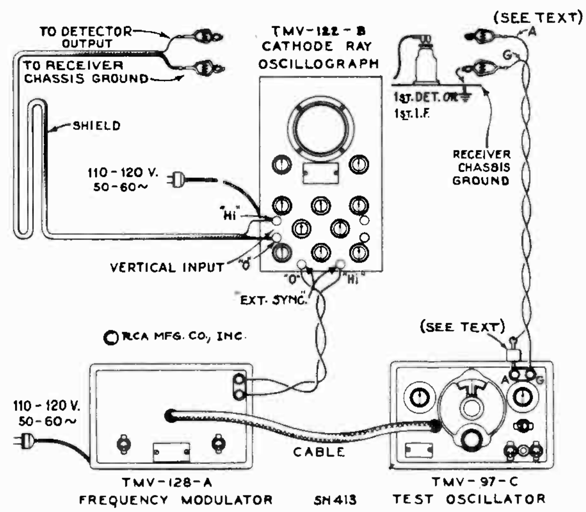


Figure 4—Alignment Apparatus Connections

figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L20** and **L19** (see figures 1 and 7) of the second i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L20** and **L19** on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the RCA-6L7 first-detector grid cap, through a **.001-mfd.** capacitor (with grid lead in place). Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

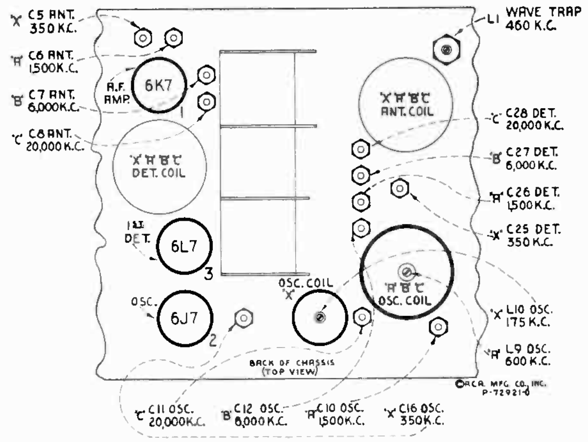
(h) The two first i-f transformer magnetite core screws **L18** and **L17** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 9. Alignment must be made in sequence of "Wave-trap," "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by



APPROX. DISTANCE IN INCHES-CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT.
C	1 1/8	1 3/16	1 5/16
B	1 1/4	1 5/16	1 9/16
A	1 3/16	1 7/16	1 3/8
X	2 1/16	1 13/16	1 1/4

Figure 5—R-F Trimmer Locations

the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C11** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C28** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C8** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080** kc. The image signal should be received at this position indicating that the adjustment of **C11** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(c) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C12** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C27** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C7** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(d) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(e) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500–3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C10, C26,** and **C6,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust trimmers **C10, C26,** and **C6** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

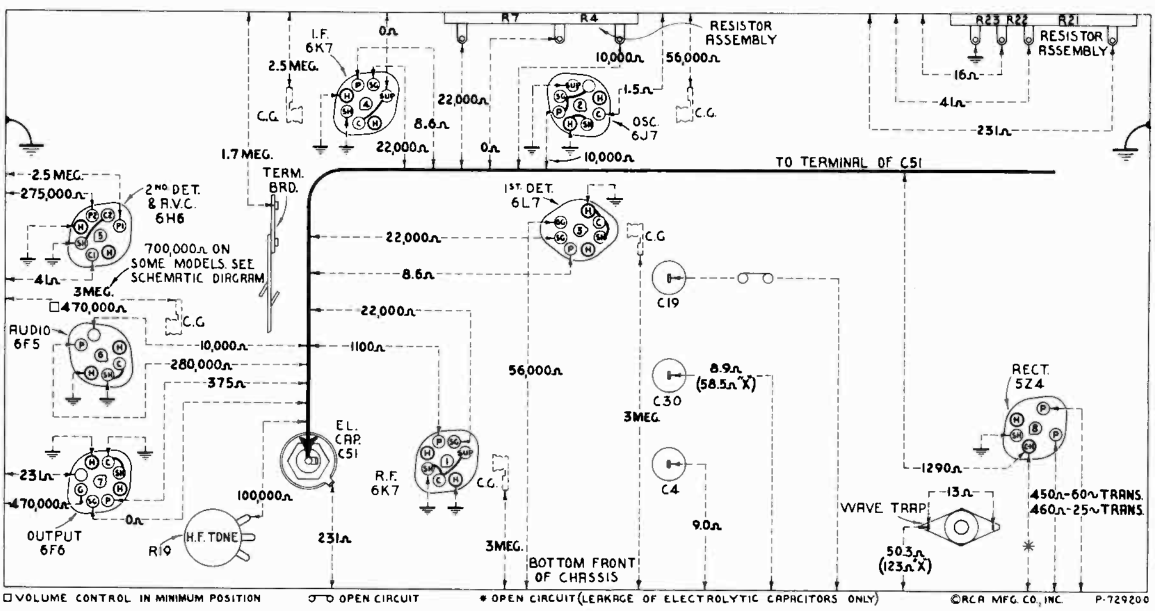


Figure 6—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum—Tone control clockwise

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 6, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagram, figure 3, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm$ 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

(f) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to 200 kc (200–400-kc range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (e) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C10, C26,** and **C6,** respectively, after each is adjusted.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F	7.5 ma.
(2)	RCA-6J7 —Osc.	5.4 ma.
(3)	RCA-6L7 —1st Det.	6.4 ma.
(4)	RCA-6K7—I.F.	7.5 ma.
(5)	RCA-6H6—2nd Det.-A.V.C.	—
(6)	RCA-6F5 —A.F.	0.3 ma.
(7)	RCA-6F6 —Power	41 ma.
(8)	RCA-5Z4—Rect.	72 ma.*
(9)	RCA-6E5 —Eye	3.0 ma.

(*Cannot be measured at socket)

"Long Wave" Band

(g) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

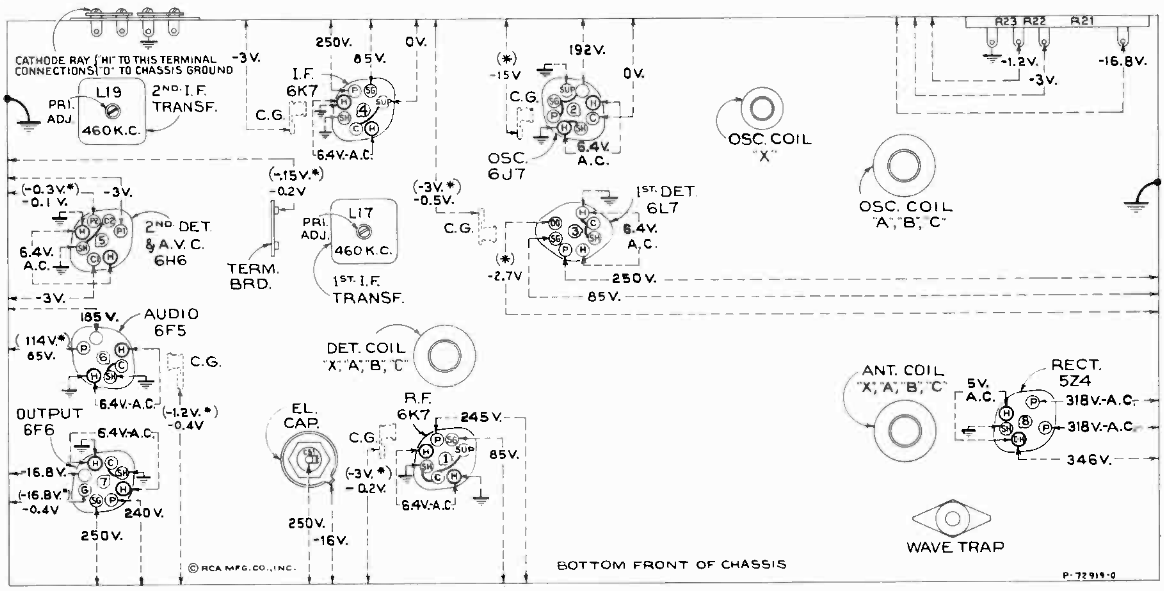


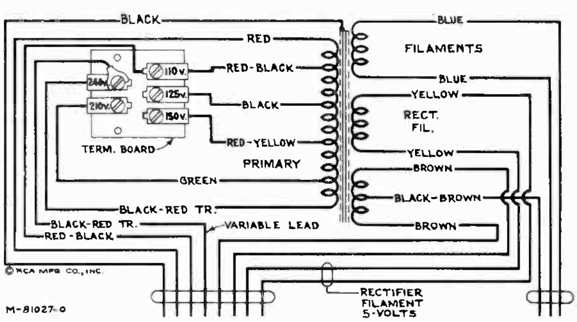
Figure 7—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum

***Note:** Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 7 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

(h) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C16, C25,** and **C5** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their



Primary resistance—13.5 ohms total
Secondary resistance—370 ohms total

Figure 8—Universal Transformer

highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C16, C25,** and **C5,** again, to produce maximum amplitude of the images and best coincidence throughout their lengths.

(i) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(j) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C16, C25,** and **C5,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C16, C25,** and **C5,** respectively, after each is adjusted.

Output Indicator Alignment

Attach the output indicator across the loudspeaker voice-coil circuit. Advance the receiver "Volume" control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of the RCA-6L7 first detector tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc.** Place its modulation switch to "On" and its output switch to "Hi."

(b) Adjust the two magnetite core screws **L20** and **L19** (see figures 1 and 7) of the second i-f transformer to produce maximum (peak) output.

(c) Adjust the two first i-f transformer magnetite core screws **L18** and **L17** to produce maximum (peak) output. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments.

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 9. Alignment must be made in sequence of "Wave-trap," "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" on the receiver through a **200-mmfd. (important)** capacitor. Place the receiver range selector to its "Standard broadcast" position and set the dial pointer to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to the point which causes minimum output (maximum suppression of signal). An increase of the test-oscillator output may be necessary before the point of minimum output, obtained by adjustment of wave-trap screw, becomes apparent on the output indicator.

"Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **300-ohm** resistor. Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C11** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C28** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C8** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The signal should be received at this position indicating that the adjustment of **C11** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(c) Place receiver range selector to its "Medium wave" position with the receiver dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C12** to produce maximum (peak) output. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C27** for maximum (peak) output while slightly rocking the receiver gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C7** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(d) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to its "Standard broadcast" position with the receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output.

(e) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc** and regulate its output until a slight indication of output is visible. Carefully adjust the oscillator, detector, and antenna air-trimmers **C10, C26,** and **C6,** respectively, to produce maximum (peak) output.

(f) Tune test oscillator to **600 kc.** Tune the receiver to pick up this signal **near 600 kc,** disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Repeat adjustments in (e) above to compensate for any change caused by adjustment of **L9** magnetite core screw, tightening lock nuts on **C10, C26,** and **C6,** respectively, after each is adjusted.

"Long Wave" Band

(g) Place receiver range selector to its "Long wave" position, with dial pointer set to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a slight indication of output is visible. Adjust oscillator magnetite core screw **L10** (top of small oscillator coil can) for maximum (peak) output.

(h) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C16, C25,** and **C5,** respectively, to produce maximum (peak) output.

(i) Tune test oscillator to **175 kc.** Tune receiver to pick up this signal **near 175 kc,** disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L10** (top of small oscillator coil can) for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Repeat adjustments in (h) above to compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C16, C25,** and **C5,** respectively, after each is adjusted.

Selector Dial

Figure 9 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed

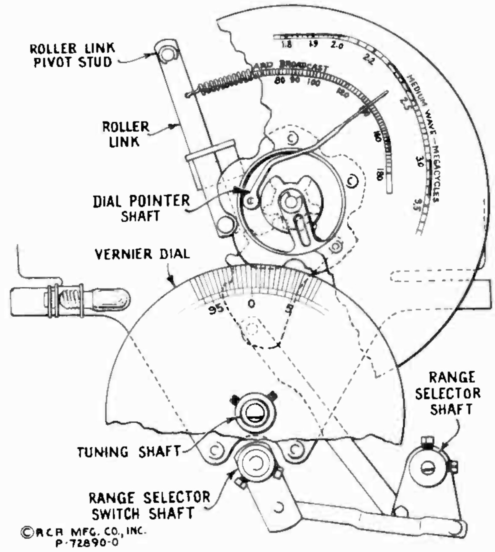


Figure 9—Selector Dial Change Mechanism

in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 2).

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This

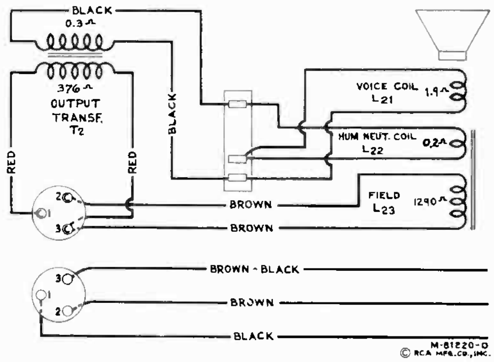


Figure 10—Loudspeaker Wiring

may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12806	Board—3-contact antenna and ground terminal board	$0.25
12863	Board—4-contact and 2-link phonograph terminal board	.25
12929	Bracket—Mounting bracket for L.F. tone control or volume control	.15
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11625	Cable—Tuning lamp cable and socket	1.26
12511	Cap—Grid contact cap—Package of 5	.15
12884	Capacitor—Adjustable trimmer (C16, C25)	.40
12807	Capacitor—Adjustable trimmer (C11, C27, C28)	.35
12714	Capacitor—Adjustable trimmer (C5, C6, C7, C8, C10, C12, C26)	.38
12896	Capacitor—15 Mmfd. (C29)	.20
12722	Capacitor—18 Mmfd. (C9)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C21)	.20
12724	Capacitor—120 Mmfd. (C20, C46)	.28
12404	Capacitor—120 Mmfd. (C32, C33, C36, C38)	.26
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C15)	.20
12406	Capacitor—180 Mmfd. (C39)	.26
12727	Capacitor—555 Mmfd. (C14)	.20
12537	Capacitor—560 Mmfd. (C3, C24, C31)	.20
12729	Capacitor—1,550 Mmfd. (C13)	.26
12728	Capacitor—4,500 Mmfd. (C18)	.36
4838	Capacitor—.005 Mfd. (C49)	.20
4858	Capacitor—.01 Mfd. (C23, C40, C47)	.25
5196	Capacitor—.035 Mfd. (C48)	.18
4836	Capacitor—.05 Mfd. (C37)	.30
4841	Capacitor—0.1 Mfd. (C34, C53)	.22
5170	Capacitor—0.25 Mfd. (C22, C52)	.25
4840	Capacitor—0.25 Mfd. (C42, C35)	.30
5212	Capacitor—18 Mfd. (C51)	1.16
12467	Capacitor—30 Mfd. (C50)	1.40
12923	Coil—Antenna coil and shield XABC bands (L2, L3, L4, L5, L6)	1.75
12924	Coil—Detector coil and shield XABC bands (L11, L12, L13, L14, L15, L16)	1.90
12709	Coil—Oscillator coil and shield ABC bands only (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield X band only (L10)	.80
12859	Compensator Pack—Comprising two sections .015 Mfd. each, one section .1 Mfd. and two resistors 27,000 ohms each (C43, C44, C45, R14, R16)	1.50
12922	Condenser—3-gang variable tuning condenser (C4, C19, C30)	4.15
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
12006	Core—Adjustable core and stud for Stock Nos. 12652 and 12653	.22
12870	Dial—Vernier dial and disc assembly	.65
5226	Lamp—Dial lamp—6.3 volt—Package of 5	.70
12868	Link—Range switch and band indicator operating link, complete with set screws	.45
5112	Resistor—1,000 ohm, carbon type, ¼ watt—Package of 5 (R2)	1.00

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
11282	Resistor—56,000 ohm, carbon type, 1/10 watt—Package of 5 (R6, R11, R3)	.75
11398	Resistor—220,000 ohm, carbon type, 1/10 watt—Package of 5 (R12)	.75
11453	Resistor—270,000 ohm, carbon type, 1/10 watt—Package of 5 (R17)	.75
11172	Resistor—470,000 ohm, carbon type, 1/4 watt—Package of 5 (R15)	1.00
11452	Resistor—470,000 ohm, carbon type, 1/10 watt—Package of 5 (R18)	.75
11397	Resistor—560,000 ohm, carbon type, 1/10 watt—Package of 5 (R1, R5)	.75
12013	Resistor—1 Meg., carbon type, 1/10 watt —Package of 5 (R20)	.75
12679	Resistor—2.2 Meg., insulated, 1/4 watt—Package of 5 (R10)	1.00
12928	Resistor—3.3 Meg., insulated, 1/4 watt—Package of 5 (R8, R9)	1.00
12927	Resistor—Voltage divider resistor, comprising one 16 ohm, one 25 ohm and one 190 ohm sections (R21, R22, R23)	.35
12715	Resistor—Wire wound resistor, comprising one 10,000 ohm and one 22,000 ohm sections (R4, R7)	.86
4669	Screw—No. 8-32-5/32 set screw for link, Stock No. 12868—Package of 10	.25
3903	Screw—No. 8-32-3/16 headless, cup point set screw for Stock No. 12870—Package of 20	.36
12925	Shaft—Range switch and band indicator operating shaft and hub assembly	.25
12651	Shield—Coil shield for Stock Nos. 12923 and 12924	.22
12710	Shield—Coil shield for Stock No. 12709.	.28
12883	Shield—Coil shield for Stock No. 12881.	.20
12926	Shield—Chassis end shield and rubber mounting foot assembly—Package of 2.	.85
12008	Shield—I. F. transformer shield for Stock Nos. 12652 and 12653	.28
12607	Shield—I. F. transformer shield top for Stock No. 12652	.30
12581	Shield—I. F. transformer shield top for Stock No. 12653	.36
5119	Socket—3-contact female connector for speaker leads	.25
11195	Socket—5-contact 5Z4 Radiotron socket.	.15
11198	Socket—7-contact 6F5, 6H6, 6K7 or 6L7 Radiotron socket	.15
11196	Socket—8-contact 6F6 or 6J7 Radiotron socket	.15
11222	Socket—Upper right or lower left hand dial lamp socket	.18
13095	Socket—Upper left or lower right hand dial lamp socket	.25
11381	Socket—Tuning lamp socket and cover..	.45
12007	Spring—Retaining spring for core, Stock Nos. 12006, 12664, 12800 and 12882—Package of 10	.36
12920	Switch—Range switch (S1, S2, S3)	2.60
12921	Tone Control—High frequency tone control (R19)	.95
12860	Tone Control—Low frequency tone control and power switch (S4, S5)	1.50
12652	Transformer—First I. F. transformer, complete (L17, L18, C32, C33)	1.60
12918	Transformer—Power transformer, 105-125 volt, 50-60 cycle (T1)	4.20
12857	Transformer—Power transformer, 105-125 volt, 25 cycle (T1)	7.10
12919	Transformer—Power transformer, 100-250 volt, 40-60 cycle (T1)	6.20
12653	Transformer—Second I. F. transformer, complete (L19, L20, C36, C38, C39, R11, R12)	2.06
12654	Trap—Wave trap, complete (L1)	.75
12861	Volume Control (R13)	1.00

Stock No.	Description	List Price
	REPRODUCER ASSEMBLIES	
12641	Board—3-contact reproducer terminal board	.15
12640	Bracket—Output transformer mounting bracket and clamp	.18
12012	Coil—Field coil (L23)	1.85
11469	Coil—Neutralizing coil (L22)	.20
12667	Cone—Reproducer cone and dust cap (L21)	1.00
5118	Connector—3-contact male speaker cable connector	.25
9696	Reproducer, complete	6.90
11253	Transformer—Output transformer (T2)..	1.56
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	DRIVE ASSEMBLIES	
10705	Ball—5/32-inch dia. steel ball for planetary drive—Package of 20	.25
10941	Ball—1/8-inch dia. steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly, complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive, complete—including mounting bracket, drive, dial scale and indicator, less vernier dial, Stock No. 12870 and link, Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear, complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly, complete with spring	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear, Stock Nos. 12905 and 12906—Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear, Stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link, Stock No. 8051—Package of 5	.32
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning lamp mounting bracket and clamp	.22
12666	Cover—Reproducer cover assembly	.65
12915	Crystal—Station selector escutcheon and crystal	1.30
12742	Escutcheon—Tuning lamp escutcheon	.22
12699	Knob—Large station selector knob—Package of 5	.68
11347	Knob—Low frequency tone control and power switch, volume control, range switch or high frequency tone control knob—Package of 5	.75
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11210	Screw—Chassis mounting screw assembly —Package of 4	.28
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12700—Package of 5.	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50

The prices quoted above are subject to change without notice.

RCA VICTOR MODELS 10T11 AND 10K11

TEN-TUBE, FIVE-BAND, A-C, SUPERHETERODYNE RECEIVERS

Technical Information and Service Data

The chassis and speakers of these instruments are identical to Models 10T and 10K respectively. The cabinet for Model 10T11 is finished in black and white with chromium trimmings which include tubular-steel support rails. The cabinet for Model 10K11 is finished with veneers of Bubinga wood and employ chromium trimmings which include tubular-steel support rails.

Service Data for Models 10T and 10K are directly applicable to these instruments except the Replacement Parts for Miscellaneous Assemblies which are listed below.

REPLACEMENT PARTS

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

STOCK NO.	DESCRIPTION
	MISCELLANEOUS ASSEMBLIES
11996	BRACKET - Tuning tube mounting bracket and clamp
13274	CRYSTAL - Station selector escutcheon and crystal
13275	ESCUTCHEON - Tuning tube escutcheon
13315	KNOB - Large station selector knob for Model 10T11
13276	KNOB - Large station selector knob for Model 10K11
13277	KNOB - Small (vernier) station selector knob for Model 10K11
13316	KNOB - Small (vernier) station selector knob for Model 10T11
13317	KNOB - Volume control, range switch, H.F. tone control or L.F. tone control and power switch knob - for Model 10T11
13278	KNOB - Volume control, range switch, H.F. tone control or L.F. tone control and power switch knob - for Model 10K11
11210	SCREW - Chassis mounting screw assembly for Model 10K11
11377	SCREW - Chassis mounting screw assembly for Model 10T11
12916	SHIELD - Magic brain shield
11349	SPRING - Retaining spring for knob stock 13277, 13278, 13316, 13317
4982	SPRING - Retaining spring for knob stock 13276, 13315

SERVICE DIVISION
RCA MANUFACTURING CO., INC.,
CAMDEN, N. J., U.S.A.

RCA VICTOR MODELS 9T and 9K2

Nine-Tube, Five-Band, A-C Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X) .... 150-410 kc
"Standard Broadcast" (A) .... 530-1,800 kc
"Medium Wave" (B) .... 1,800-6,400 kc
"Short Wave" (C) .... 6,400-23,000 kc
"Ultra Short Wave" (D) ....23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X) .... 175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A) .... 600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B) .... 6,000 kc (osc., det., ant.)
"Short Wave" (C) ..... 20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D) .. 57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6K7 .... R-F Amplifier
(2) RCA-6L7 .... First Detector
(3) RCA-6J7 .... Oscillator
(4) RCA-6K7 .... I-F Amplifier
(5) RCA-6H6 .... Second Detector and A.V.C.
(6) RCA-6F5 .... Audio Voltage Amplifier
(7) RCA-6L6 .... Power Output
(8) RCA-6E5 .... Tuning Tube
(9) RCA-5Z4 .... Full-Wave Rectifier

Pilot Lamps (4) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A .... 105-125 volts, 50-60 cycles, 120 watts
Rating B .... 105-125 volts, 25-60 cycles, 120 watts
Rating C .... 100-130/140-160/195-250 volts, 40-60 cycles, 120 watts

POWER OUTPUT

Undistorted .... 5 watts
Maximum .... 9 watts

LOUDSPEAKER

Type .... Electrodynamic
Impedance (V.C.) .... 2.2 ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS	MODEL 9T	MODEL 9K2
Height	22 7/8 inches	41 inches
Width	17 1/2 inches	27 3/16 inches
Depth	12 5/16 inches	14 1/2 inches
WEIGHTS		
Net	44 pounds	86 pounds
Shipping	53 pounds	129 pounds

Chassis Base Dimensions .... 15 inches x 9 3/4 inches x 3 inches
Over-all Height of Chassis .... 9 1/4 inches
Operating Controls. (1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Tone
Tuning Drive Ratios .... 20 to 1 and 100 to 1

General Description

These receivers represent the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model 9T is a nine-tube, table-type, "Magic Brain" superheterodyne receiver with an eight-inch electrodynamic loudspeaker. Model 9K2 employs an identical radio chassis, is of the console-type, has a twelve-inch electrodynamic loudspeaker, and incorporates the newly developed "Magic Voice." Design features incorporated in these receivers include built-in doublet antenna coupler; "Magic Brain"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; two-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof electrodynamic loudspeaker.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave", "Short wave", and "Ultra short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, an i-f amplifier stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, a beam-type power-amplifier stage, a tuning indicator "Magic Eye", and a full-wave rectifier.

"Magic Brain"

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7

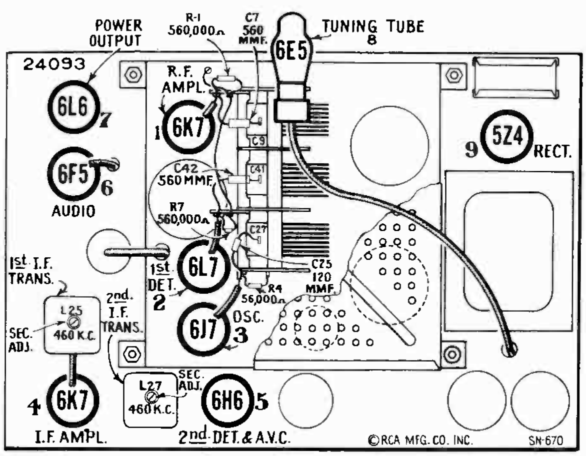


Figure 1—Radiotron and I-F Trimmer Locations

r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a 7/8-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted directly by the range selector. Any inductive effect of L16 is thus eliminated. L19, L18, and L17 are shorted directly by the range selector.

Separate windings are employed in the oscillator stage for each position of the range selector. The inherent stability of this circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to control grid No. 2 of the RCA-6L7 first detector.

The output of the "Magic Brain" is fed to the i-f amplifier through the plug-in cable. This cable also supplies all power required by the "Magic Brain" unit.

I-F Amplifier

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R12 and R13, is applied as automatic control-grid bias to the first-detector and i-f tubes. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R11, R12, and R13, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias-diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6F5 audio voltage-amplifier tube. This control has a two-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6L6 power output tube. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S5 which, in the "Speech" position, places an additional capacitor C57 in shunt with the capacitor C56 in one of the tone compensating filters. This reduces the low-frequency response of the amplifier and provides maximum intelligibility of the voice frequencies.

Continuously variable tone control is effected by means of capacitor C62 and variable resistor R27 shunting the plate circuit of the output tube.

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. A portion of the signal voltage developed across resistor R13 is used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by the minimum width of the dark sector on the fluorescent screen.

"Magic Voice" (Model 9K2)

Model 9K2 is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

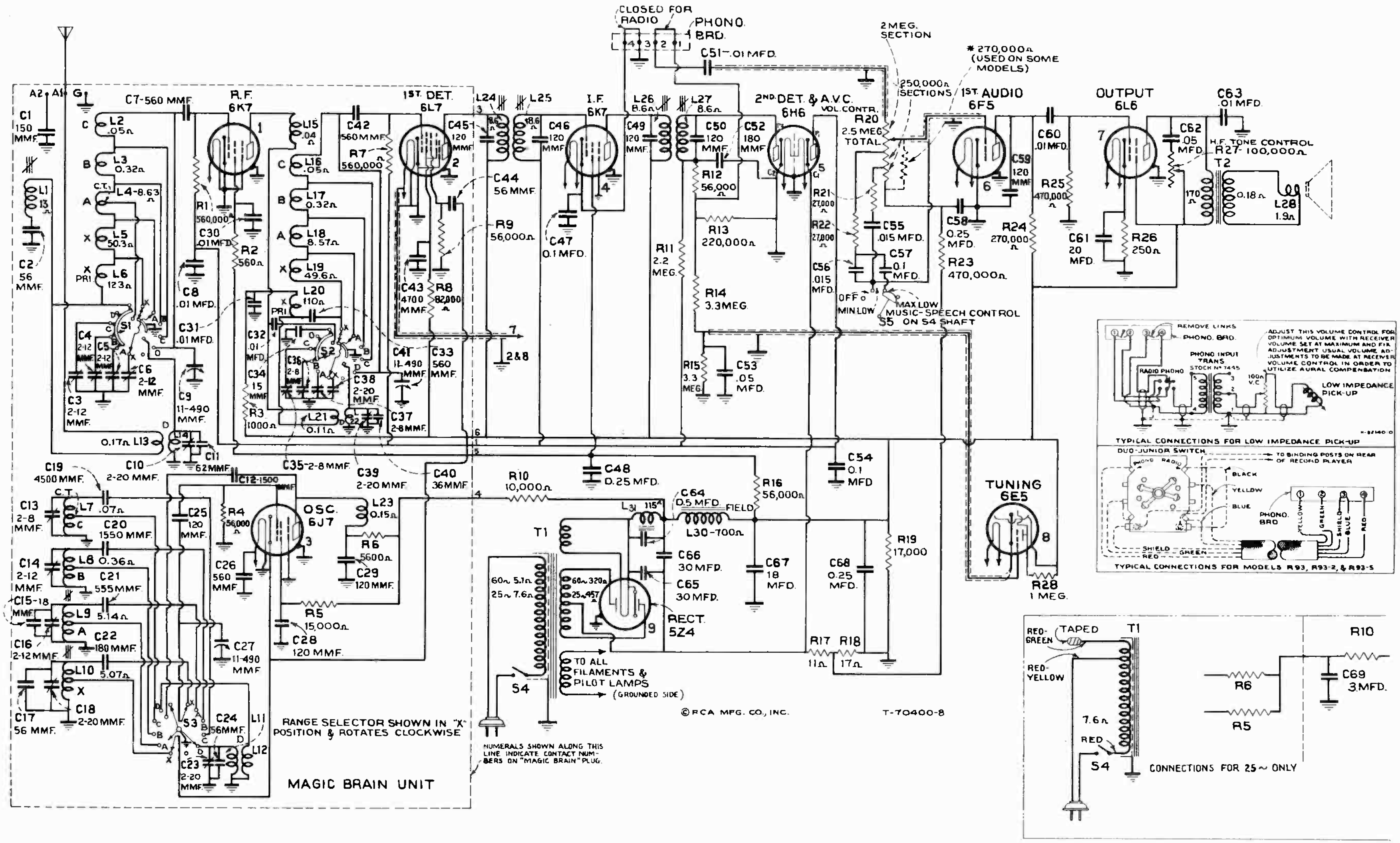
Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and four adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining seven adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained



SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) Low sensitivity or intermittent operation may be caused by C-43 or C-33 developing low-resistance leakage. Check both capacitors and replace if found defective.

(3) Low sensitivity around 15—16 megacycles may be caused by dirty or poor contact of grounding contact finger on S-3.

Figure 2—Schematic Circuit Diagram

(* 270,000-ohm resistor not required when replacing volume control with Stk. No. 12861)

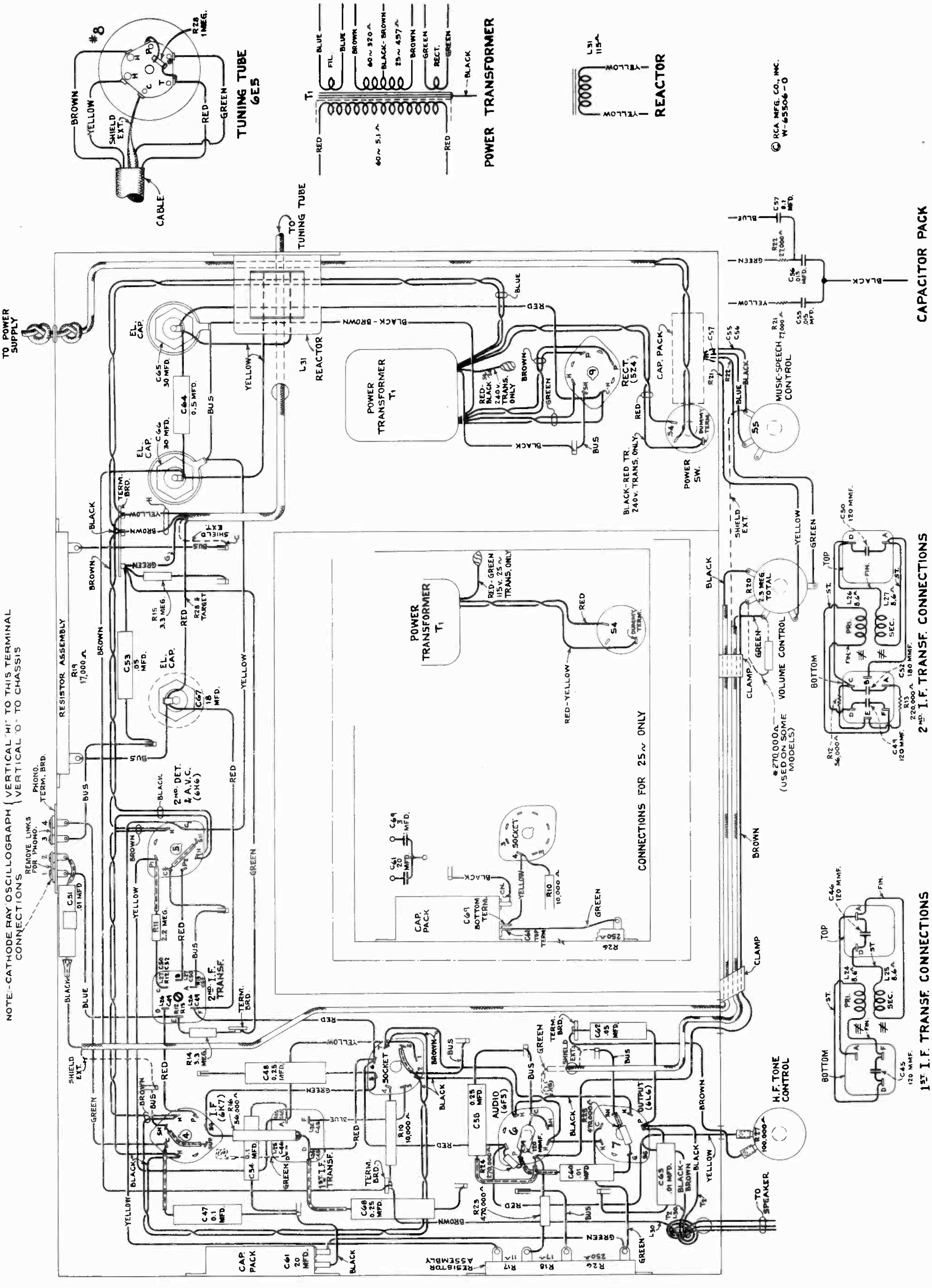


Figure 3—Chassis Wiring Diagram (Less "Magic Brain")

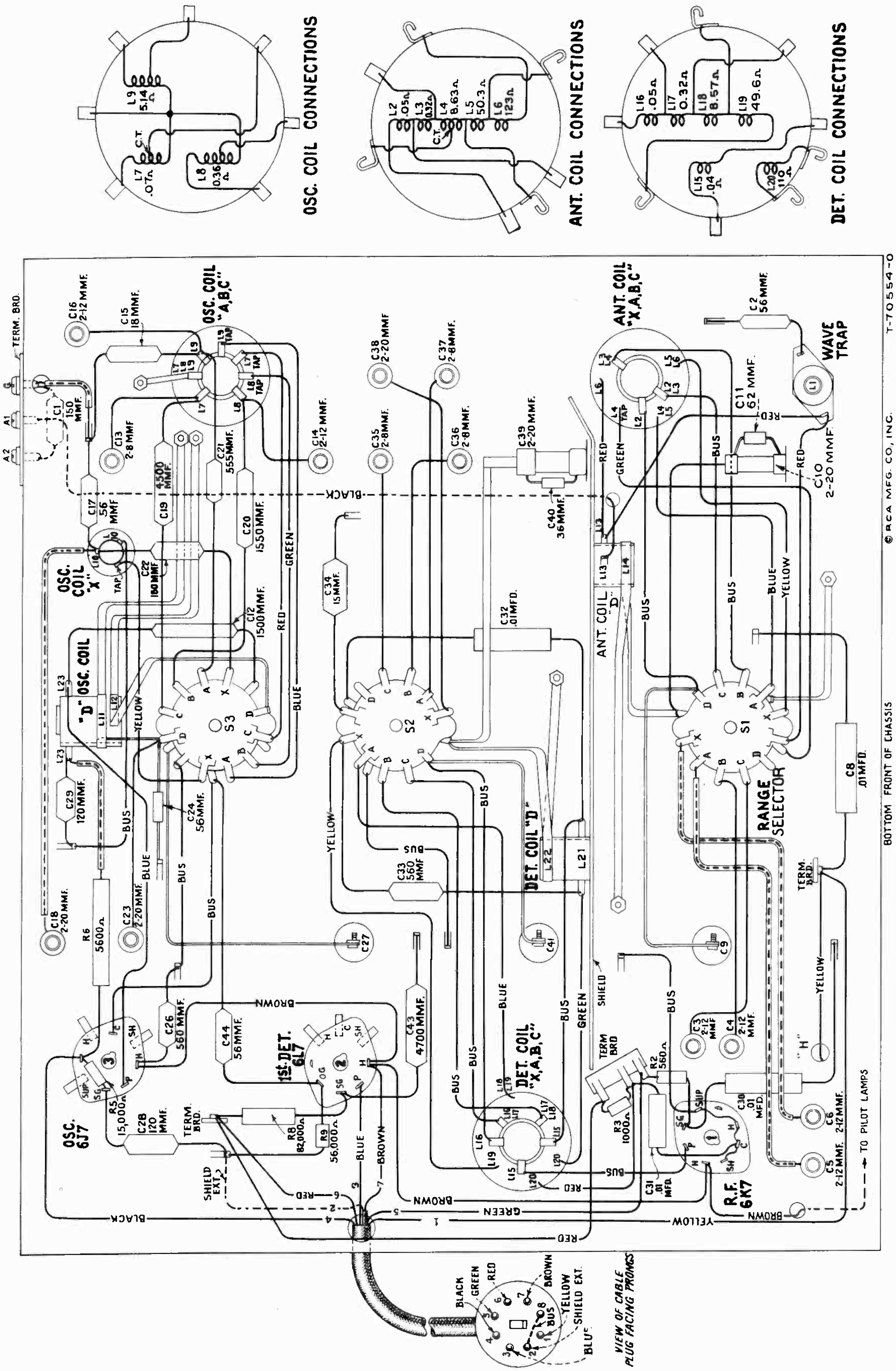


Figure 4—"Magic Brain" Wiring Diagram

when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of these receivers necessitates a more or less involved method of alignment. However, it the following directions are carefully applied in the sequence given, normal performance of the instruments will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 6. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment

(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C-10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 6. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are **920 kc** apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency **460 kc** below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** The output-indicator method should be performed with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator.** Both of these procedures are outlined below.

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 5. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The

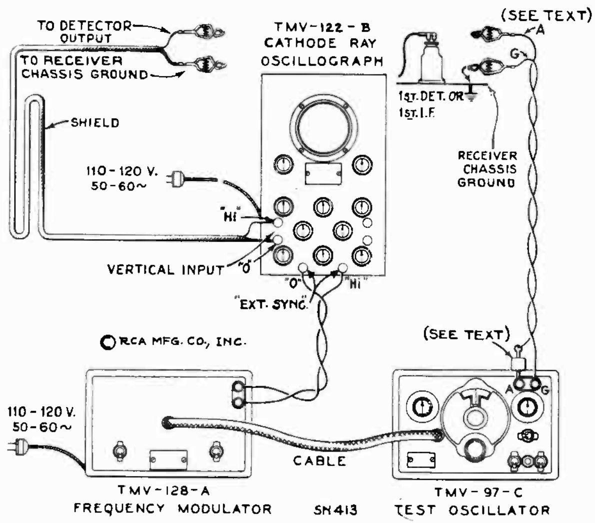


Figure 5—Alignment Apparatus Connections

figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L27** and **L26** (see figures 1 and 8) of the second i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L27** and **L26** on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the RCA-6L7 first-detector grid cap, through a **.001-mfd.** capacitor (with grid lead in place). Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 11. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

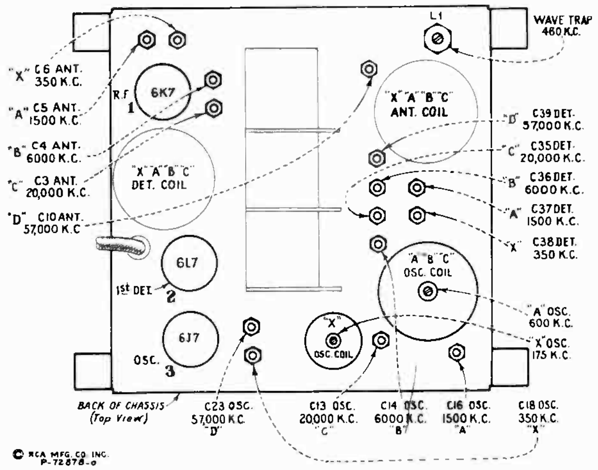
"Wave-Trap" Adjustment

(a) Connect the output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc**. Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment. If the indication on the oscillograph screen is not sufficient for the following adjustments at **57,000 kc**, the vertical-input terminals of the cathode-ray oscillograph may be connected thus: "Hi" to the plate contact of the RCA-6L6 power-output tube socket with the "0" terminal to chassis-ground. The receiver should be turned off while making this connection since the plate potential is impressed across the oscillograph input and a severe shock will result if contact is made between these two points. If this connection is made, advance the receiver volume control to its maximum position. Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings **(230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc)** without altering test-oscillator adjustment. Test-oscillator second harmonic of **14,250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater than **28,500 kc,** the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of **L11** and **L12** (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps till maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without



APPROX. DISTANCE IN INCHES—CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT.
D	1½	1⅞	1⅝
C	1 7/16	1⅛	1 1/16
B	1⅜	1⅛	1⅜
A	1½	1	1¼
X	1½	1 15/16	1 9/16

Figure 6—"Magic Brain" Trimmer Locations

changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** If the vertical input cathode-ray connections were changed for adjustment (b) above, they should be restored to their original position as shown on figure 3. Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The image signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C4 to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500–3,100-kc range)** and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37** and **C5,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator

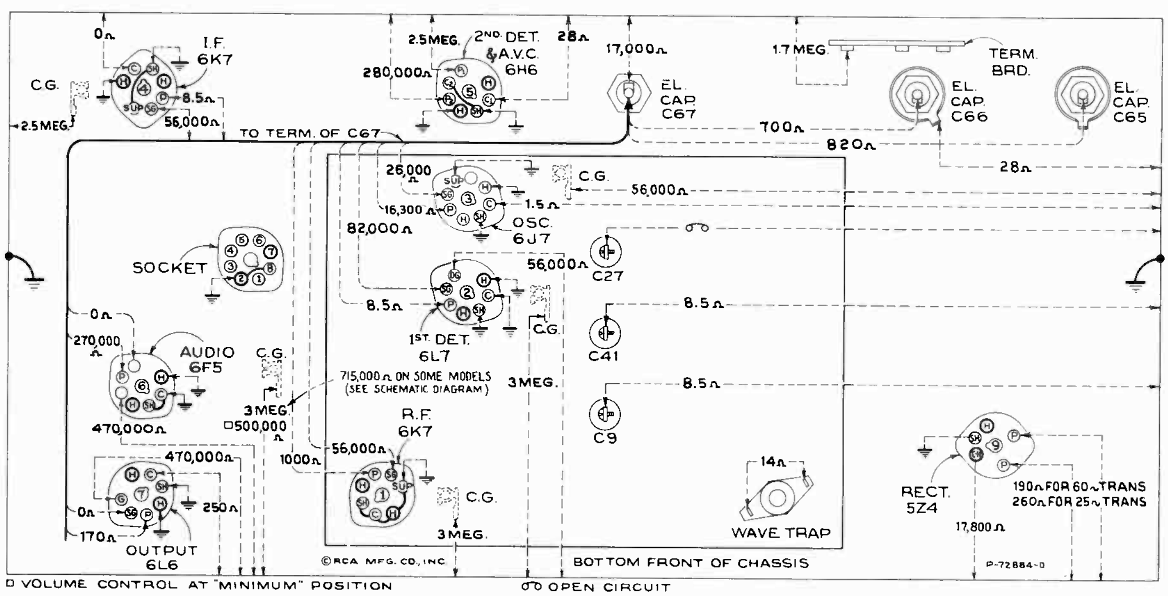


Figure 7—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 7, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagrams, figures 3 and 4, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. In all cases of measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc (200–400-kc** range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F	8.0 ma.
(2)	RCA-6L7—1st Det.	4.4 ma.
(3)	RCA-6J7—Osc.	6.7 ma.
(4)	RCA-6K7—I.F.	8.0 ma.
(5)	RCA-6H6—2nd Det.-A.V.C.	—
(6)	RCA-6F5—A.F.	0.3 ma.
(7)	RCA-6L6—Power	63 ma.
(8)	RCA-6E5—Eye	3.0 ma.
(9)	RCA-5Z4—Rect.	110 ma. *

(* Cannot be measured at socket contact)

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place re-

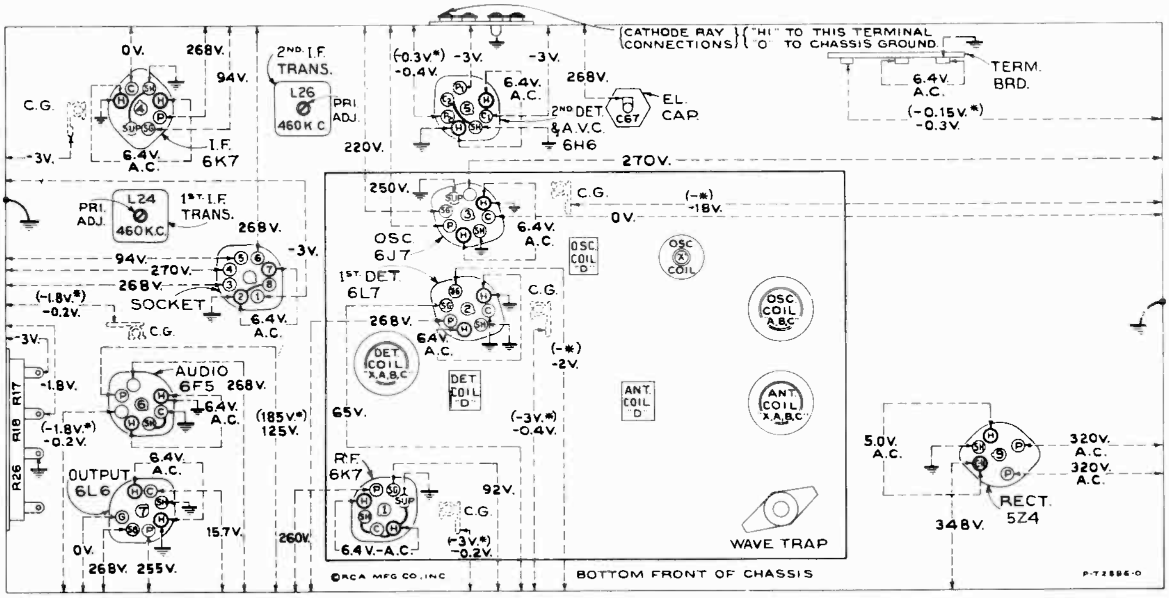


Figure 8—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum

***Note:** Two voltage values are shown for some readings. The higher value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The lower value is the actual measured voltage and differs from the higher value because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 8 will assist in locating cause for faulty operation. Each value as specified should hold within $\pm 20\%$ when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the voltage to be measured. A-c voltages were measured with a corresponding a-c meter.

ceiver range selector to its "Long wave" position. Set the receiver dial pointer to 175 **kc.** Tune the test oscillator to 175 **kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to 350 **kc.** Tune test oscillator to 350 **kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately** 198 **kc.** This setting places the test-oscillator frequency to 175 **kc.** The second harmonic is now used for the 350 **kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the images and best coincidence throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to 350 **kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Output Indicator Alignment

Attach the output indicator across the loudspeaker voice-coil circuit. Advance the receiver "Volume" control to its maximum position, letting it remain in such position for all adjustments. For each adjusting operation, regulate the test-oscillator output so that the signal level is as low as possible and still be observable at the receiver output. Use of such small signal will obviate broadness of tuning which would otherwise result from a.v.c. action on a stronger one.

I-F Adjustments

(a) Connect the "Ant." output of the test oscillator to the grid cap of the RCA-6L7 first detector tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to 460 **kc.** Place its modulation switch to "On" and its output switch to "Hi."

(b) Adjust the two magnetite core screws of the second i-f transformer (one on top and one on bottom) to produce maximum (peak) output.

(c) The two first i-f transformer magnetite core screws (one on top and one on bottom) should be adjusted to produce maximum (peak) output. It is advisable to repeat the adjustment of all i-f magnetite core screws to assure that the interaction between them has not disturbed the original adjustments.

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 11. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

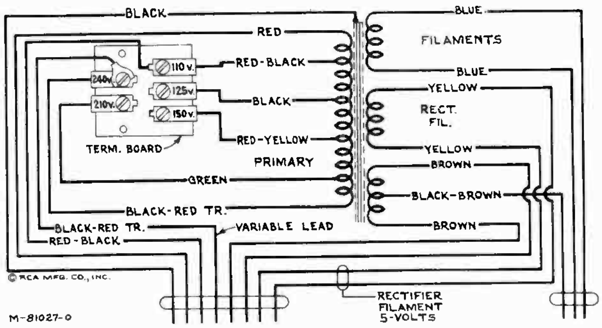
(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" on the receiver through a **200-mmfd. (important)** capacitor. Place the range selector to its "Standard broadcast" position and set the receiver dial pointer to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to 460 **kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum output (maximum suppression of signal). An increase of the test-oscillator output may be necessary before the point of minimum output, obtained by adjustment of wave-trap screw, becomes apparent on the output indicator.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **300-ohm** resistor. Set receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment. Adjust the oscillator air-trimmer **C23** for maximum (peak) output. Two positions for maximum output may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator 460 **kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39** while slightly rocking the gang tuning condenser back and forth through the signal for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut.

Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800–14,000-kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth har-



Primary resistance—10.1 ohms total
Secondary resistance—226 ohms total
Figure 9—Universal Transformer

monic of test oscillator used). Two test-oscillator settings (**230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting of **approximately 27,580 kc**) without altering test-oscillator adjustment. Test-oscillator second harmonic of **14,250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver-dial reading is greater than **28,500 kc,** the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of **L11** and **L12** (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps till maximum (peak) output results. The alignment of the detector-tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end strap of **L22** and the strap connected from **C41** to contact on **S2.** An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with the receiver dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the receiver gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C4** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to its "Standard broadcast" position with the receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc** and regulate its output until a slight indication of output is visible. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37,** and **C5,** respectively, to produce maximum (peak) output.

(h) Tune test oscillator to **600 kc.** Tune the receiver to pick up this signal **near 600 kc,** disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Repeat adjustments in (g) above to compensate for any change caused by adjustment of **L9** magnetite core screw, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Place receiver range selector to its "Long wave" position, with dial pointer set to 175 kc. Tune the test oscillator to 175 kc and increase its output until a slight indication of output is visible. Adjust oscillator magnetite core screw **L10** (top of small oscillator coil can) for maximum (peak) output.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to 350 kc. Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum (peak) output.

(k) Tune test oscillator to **175 kc.** Tune receiver to pick up this signal **near 175 kc,** disregarding the dial reading at which it is best received. Adjust oscillator magnetite core screw **L10** (top of small oscillator coil can) for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Repeat adjustments in (j) above to compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This

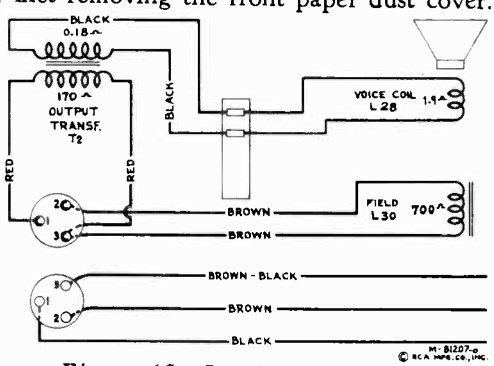


Figure 10—Loudspeaker Wiring

may be removed either permanently by cutting it away with a sharp knife, or by softening its cement with a very slight application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 2).

Selector Dial

Figure 11 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed

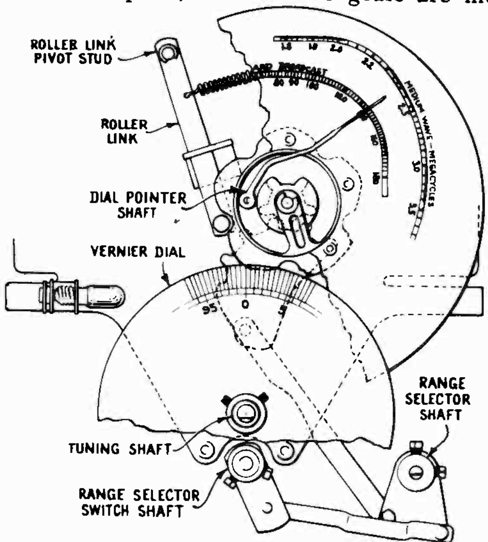


Figure 11—Selector Dial Change Mechanism

in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12863	Board—4-contact and 2-link phonograph terminal board	$0.25
4427	Bracket—Mounting bracket for H.F. tone control, L.F. tone control or volume control	.18
12867	Cable—Tuning lamp cable and socket	1.70
12511	Cap—Grid contact cap—Package of 5	.15
12859	Capacitor Pack—Comprising two sections .015 Mfd., one section .1 Mfd., and two resistors 27,000 ohms each (C55, C56, C57, R21, R22)	1.50
12873	Capacitor Pack—Comprising one 3 Mfd. and one 20 Mfd. section used in 25 cycle Model only (C61, C69)	1.20
12724	Capacitor—120 Mmfd. (C59)	.28
12404	Capacitor—120 Mmfd. (C45, C46, C49, C50)	.26
12406	Capacitor—180 Mmfd. (C52)	.26
4624	Capacitor—.01 Mfd. (C51)	.54
4858	Capacitor—.01 Mfd. (C60)	.25
4937	Capacitor—.01 Mfd. (C63)	.25
4836	Capacitor—.05 Mfd. (C53)	.30
4886	Capacitor—.05 Mfd. (C62)	.20
4841	Capacitor—.1 Mfd. (C54)	.22
11414	Capacitor—.1 Mfd. (C47)	.20
4840	Capacitor—.25 Mfd. (C58)	.30
5170	Capacitor—.25 Mfd. (C48, C68)	.25
12741	Capacitor—.5 Mfd. (C64)	.34
5212	Capacitor—18 Mfd. (C67)	1.16
12872	Capacitor—20 Mfd. (C61)	.90
12467	Capacitor—30 Mfd. (C65, C66)	1.40
5119	Connector—3-contact female connector for speaker leads	.25
12006	Core—Adjustable core and stud for Stock No. 12652 and 12653	.22
12870	Dial—Vernier dial and disc assembly	.65
12866	Foot—Chassis mounting bracket and foot assembly—Package of 2	.75
5226	Lamp—Dial lamp—6.3 volt—Package of 5	.70
12868	Link—Range switch and band indicator operating link complete with set screw	.45
12871	Reactor—Filter reactor (L31)	1.50
12865	Resistor—Voltage divider resistor—Comprising one section 250 ohm, one section 17 ohm and one section 11 ohm (R17, R18, R26)	.45
12876	Resistor—10,000 ohms—wire wound, 10 watt (R10)	.55
12864	Resistor—17,000 ohms—wire wound (R19)	.70
11282	Resistor—56,000 ohms—carbon type—1/10 watt (R12)—Package of 5	.75
12875	Resistor—56,000 ohms—carbon type—1 watt (R16)—Package of 5	1.10
11398	Resistor—220,000 ohms—carbon type—1/10 watt (R13)—Package of 5	.75
11453	Resistor—270,000 ohms—carbon type—1/10 watt (R24)—Package of 5	.75
11172	Resistor—470,000 ohms—carbon type—¼ watt (R23)—Package of 5	1.00
11452	Resistor—470,000 ohms—carbon type—1/10 watt (R25)—Package of 5	.75
12013	Resistor—1 Megohm—carbon type—1/10 watt (R28)—Package of 5	.75
11626	Resistor—2.2 Megohm—carbon type—¼ watt (R11)—Package of 5	1.00
12874	Resistor—3.3 Megohm—carbon type—¼ watt (R14, R15)—Package of 5	1.00
4669	Screw—No. 8-32-5/32 set screw for link Stock No. 12868—Package of 10	.25
3903	Screw—No. 8-32-3/16 headless cup point set screw for Stock No. 12870—Package of 20	.36
12869	Shaft—Range switch and band indicator operating shaft and hub assembly	.25
12008	Shield—I.F. transformer shield for Stock No. 12652, 12653	.28
12607	Shield—I.F. transformer shield for Stock No. 12652	.30
12581	Shield—I.F. transformer shield top for Stock No. 12653	.36
13095	Socket—Dial lamp socket	.25
11222	Socket—Dial lamp socket	.18
11381	Socket—Tuning lamp socket and cover	.45
11195	Socket—5-contact 5Z4 radiotron socket	.15
11198	Socket—7-contact 6H6, 6K7, 6L6 or 6F5 radiotron sockets	.15
11196	Socket—8-contact socket for R.F. unit power cable plug	.15
12007	Spring—Retaining spring for Stock No. 12006	.36
12860	Tone Control—Low frequency tone control and power switch (S4, S5)	1.50
12862	Tone Control—High frequency tone control (R27)	1.00
12652	Transformer—First I.F. transformer complete (L24, L25, C45, C46)	1.60
12856	Transformer—Power transformer 105-125 volt, 50-60 cycle (T1)	5.35
12857	Transformer—Power transformer 105-125 volt, 25 cycle (T1)	7.10
12858	Transformer—Power transformer 100-250 volt, 40-60 cycle (T1)	8.75
12653	Transformer—Second I.F. transformer complete (L26, L27, C49, C50, C52, R12, R13)	2.06
12861	Volume Control—(R20)	1.00
	MAGIC BRAIN UNIT ASSEMBLIES	
12806	Board—3-contact antenna and ground terminal board	.25
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12886	Cable—Shielded power cable approx. 4-in. long complete with 8-contact male plug	1.50
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	.38

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1,500 Mmfd. (C12)	.20
12729	Capacitor—1,550 Mmfd. (C20)	.26
12728	Capacitor—4,500 Mmfd. (C19)	.36
12897	Capacitor—4,700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil "D" band (L13, L14)	.60
12880	Coil—Detector coil and shield XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield X band only (L10)	.80
12890	Coil—Oscillator coil "D" band (L11, L12, L23)	.70
12889	Coil—R.F. coil "D" band (L21, L22)	.65
12877	Condenser—3-gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8-contact male connector and cover for power cable Stock No. 12886	.40
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
11324	Resistor—560 ohms—carbon type—¼ watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type—¼ watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type—1 watt (R6)	.22
3998	Resistor—15,000 ohms—carbon type—¼ watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—carbon type—1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—carbon type—½ watt (R8)—Package of 5	1.00
11397	Resistor—560,000 ohms—carbon type—1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stock Nos. 12879, 12880	.22
12710	Shield—Coil shield for Stock No. 12709	.28
12883	Shield—Coil shield for Stock No. 12881	.20
11198	Socket—7-contact 6K7 radiotron socket	.15
11279	Socket—7-contact 6L7 radiotron socket	.20
12885	Socket—8-contact 6J7 radiotron socket	.20
12007	Spring—Retaining spring for core Stock Nos. 12664, 12800, 12882—Package of 10	.36
12878	Switch—Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave trap complete (L1)	.75
	DRIVE ASSEMBLIES	
10705	Ball—5/32-in. dia. steel ball for planetary drive—Package of 20	.25
10941	Ball—1/8-in. dia. steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive complete including mounting bracket, drive, dial scale, and indicator less vernier dial Stock No. 12870 and link Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly complete with spring	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear Stock No. 12905 and 12906—Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear Stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link Stock No. 8051—Package of 5	.32
	REPRODUCER ASSEMBLIES	
12914	Board—3-contact reproducer terminal board	.25
12640	Bracket—Output transformer mounting bracket and clamp assembly	.18
12912	Coil—Field coil (L30)	1.70
12642	Cone—Reproducer cone and dust cap (L28) (Model 9T)	.94
12667	Cone—Reproducer cone and dust cap (L28) (Model 9K2)	1.00
5118	Plug—3-contact male reproducer plug	.25
9714	Reproducer Complete—(Model 9T)	6.85
9716	Reproducer Complete—(Model 9K2)	7.80
12913	Transformer—Output transformer (T2)	1.45
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning lamp mounting bracket and clamp	.22
12915	Crystal—Station selector escutcheon and crystal	1.30
12742	Escutcheon—Tuning lamp escutcheon	.22
12699	Knob—Large station selector knob—Package of 5	.68
11347	Knob—Low frequency tone control and power switch volume control range switch or high frequency tone control knob—Package of 5	.75
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11377	Screw—Chassis mounting screw assembly for table model only—Package of 4	.12
11210	Screw—Chassis mounting screw assembly for console model only—Package of 4	.28
12916	Shield—Complete R.F. unit shield	.90
11349	Spring—Retaining spring for knob Stock No. 11347 and 12700—Package of 5	.25
4982	Spring—Retaining spring for knob Stock No. 12699—Package of 10	.50

The prices quoted above are subject to change without notice.

RCA VICTOR MODELS 9U and 9U2

Nine-Tube, Five-Band, A-C Radio-Phonographs
TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X) .... 150-410 kc
"Standard Broadcast" (A) .... 530-1,800 kc
"Medium Wave" (B) .... 1,800-6,400 kc
"Short Wave" (C) .... 6,400-23,000 kc
"Ultra Short Wave" (D) .... 23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X) .... 175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A) .... 600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B) .... 6,000 kc (osc., det., ant.)
"Short Wave" (C) ...... 20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D) . 57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6K7 .... R-F Amplifier
(2) RCA-6L7 .... First Detector
(3) RCA-6J7 .... Oscillator
(4) RCA-6K7 .... I-F Amplifier
(5) RCA-6H6 .... Second Detector and A.V.C.
(6) RCA-6F5 .... Audio Voltage Amplifier
(7) RCA-6L6 .... Power Output
(8) RCA-6E5 .... Tuning Tube
(9) RCA-5Z4 .... Full-Wave Rectifier

PILOT LAMPS

Model 9U
- (1) Phono compartment .... Mazda No. 40, 6.3 volts, 0.15 ampere
- (4) Receiver .... Mazda No. 46, 6.3 volts, 0.25 ampere

Model 9U2
- (3) Phono compartment, indicator, lower right-hand front of tuning dial, Mazda No. 40, 6.3 volts, 0.15 ampere
- (3) Upper left-, lower left-, upper right-hand front of tuning dial, Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A-6 (Model 9U only) .... 105-125 volts, 60 cycles, 150 watts
Rating A-5 (Model 9U only) .... 105-125 volts, 50 cycles, 155 watts
Rating B-2 .... 105-125 volts, 25 cycles, 150 watts
Rating C-6 .... 105-130/140-160/200-250 volts, 60 cycles, 150 watts
Rating C-5 .... 105-130/140-160/200-250 volts, 50 cycles, 155 watts

PHONOGRAPH

Type .... Automatic Record Ejector
Record Capacity ...... Seven 10-inch or Six 12-inch
Turntable Speed .... 78 R.P.M.
Type of Pickup .... Low-Impedance Magnetic
Pickup Impedance .... 8.5 ohms at 1,000 cycles

POWER OUTPUT RATINGS

Undistorted .... 5 watts
Maximum .... 9 watts

LOUDSPEAKER

Type .... 12-inch Electrodynamic
Impedance (V.C.) .... 2.2 ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS	MODEL 9U	MODEL 9U2
Height	43 inches	34 inches
Width	30⅞ inches	46¾ inches
Depth	18⅝ inches	18⅝ inches

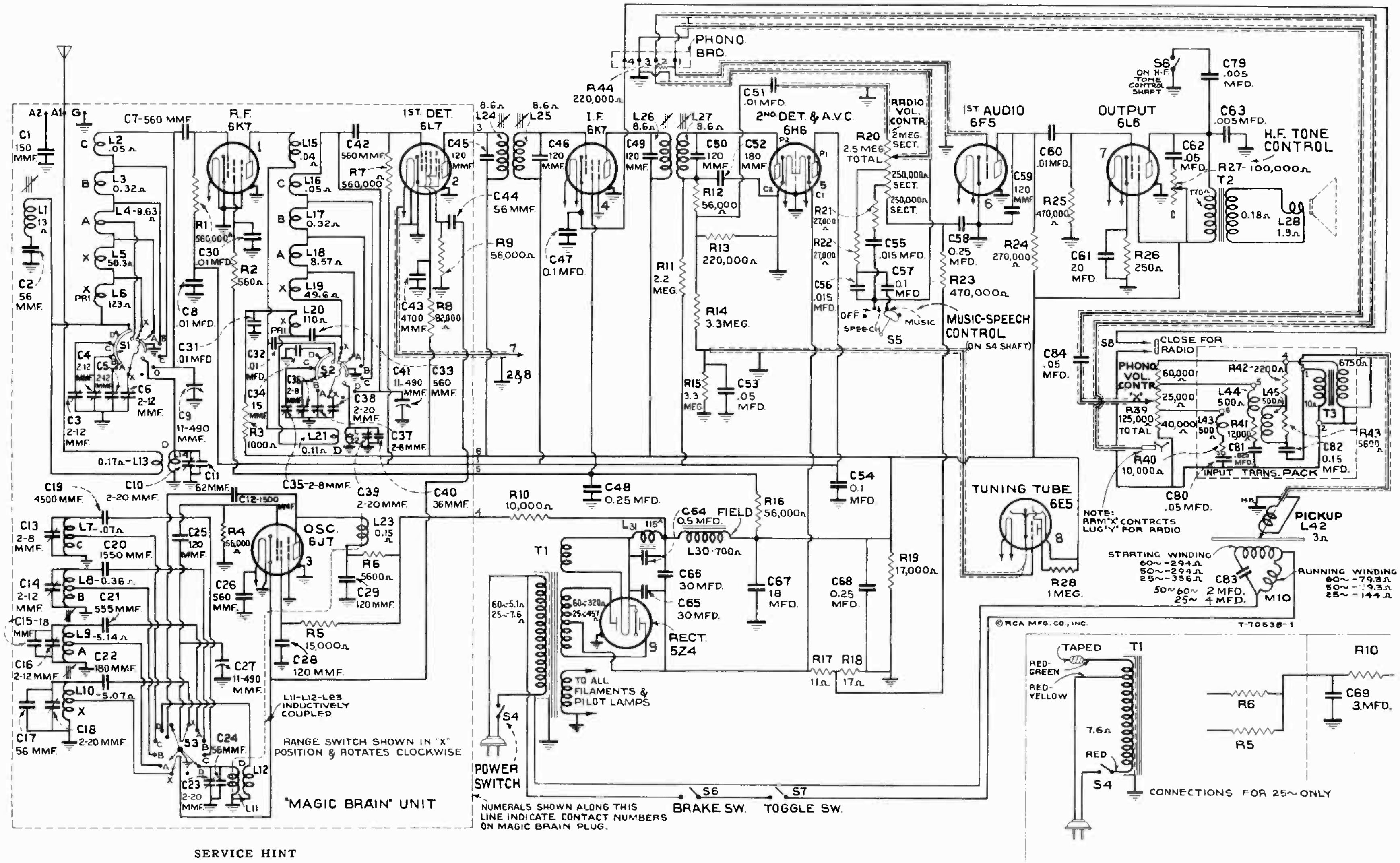
WEIGHTS		
Net	162 pounds	205 pounds
Shipping	222 pounds	287 pounds

Chassis Base Dimensions .... 15 inches x 9¾ inches x 3 inches
Over-all Height of Chassis .... 9¼ inches

OPERATING CONTROLS

Radio .... (1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Tone
Phonograph .... (1) Turntable Switch, (2) Radio-Phono Transfer Switch—Volume, (3) Index

Tuning Drive Ratios .... 20 to 1 and 100 to 1



SERVICE HINT

Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

Figure 1—Schematic Circuit Diagram

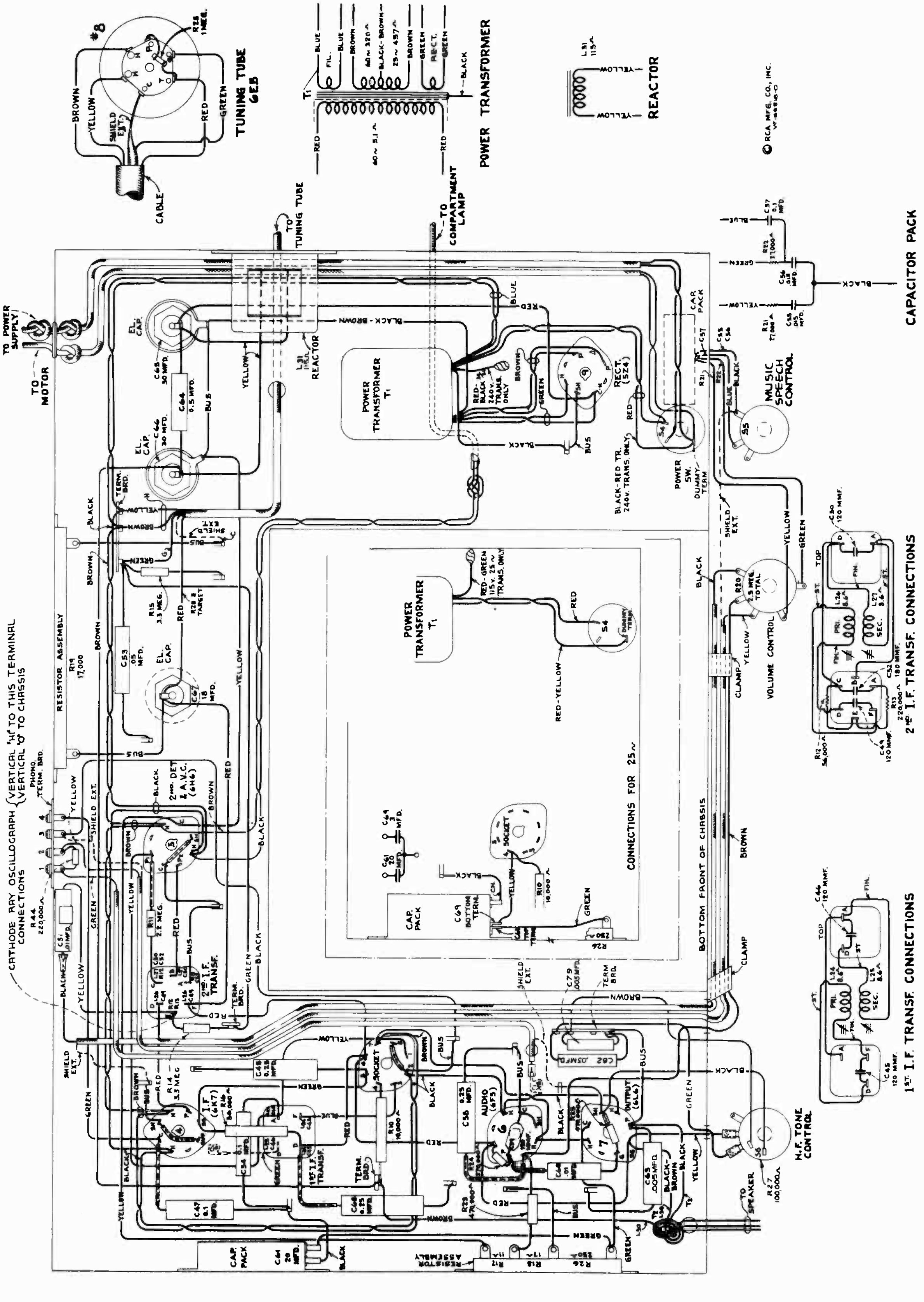


Figure 2—Chassis Wiring Diagram (Less "Magic Brain") Model 9U

General Description

The RCA Victor Models 9U and 9U2 combination instruments each consist of a nine-tube, five-band, "Magic Brain" superheterodyne receiver in combination with an automatically-operated phonograph, providing excellent entertainment from either radio reception or record reproduction. These instruments are electrically identical but differ in mechanical construction and cabinet design. Model 9U has the radio chassis mounted directly below the phonograph motor board with its controls operated from the front of the cabinet. Model 9U2 has its radio chassis mounted vertically to the right of the phonograph motor board. The respective controls in the phonograph and the radio compartments are made accessible by means of separate hinged covers at the top of the cabinet. Both instruments employ a twelve-inch electrodynamic loudspeaker and incorporate the newly-developed "Magic Voice." Design features include a built-in doublet antenna coupler; "Magic Brain"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; two-point aural compensated radio and phonograph volume controls; music-speech switch; automatic volume control; continuously-variable high-frequency tone control; improved selector dial; dust-proof electrodynamic loudspeaker; and an automatic record player employing a synchronous motor.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave," "Short wave," and "Ultra short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, an i-f amplifier stage, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, a beam-type power-amplifier stage, a tuning indicator "Magic Eye," and a full-wave rectifier.

"Magic Brain"

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7 r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short

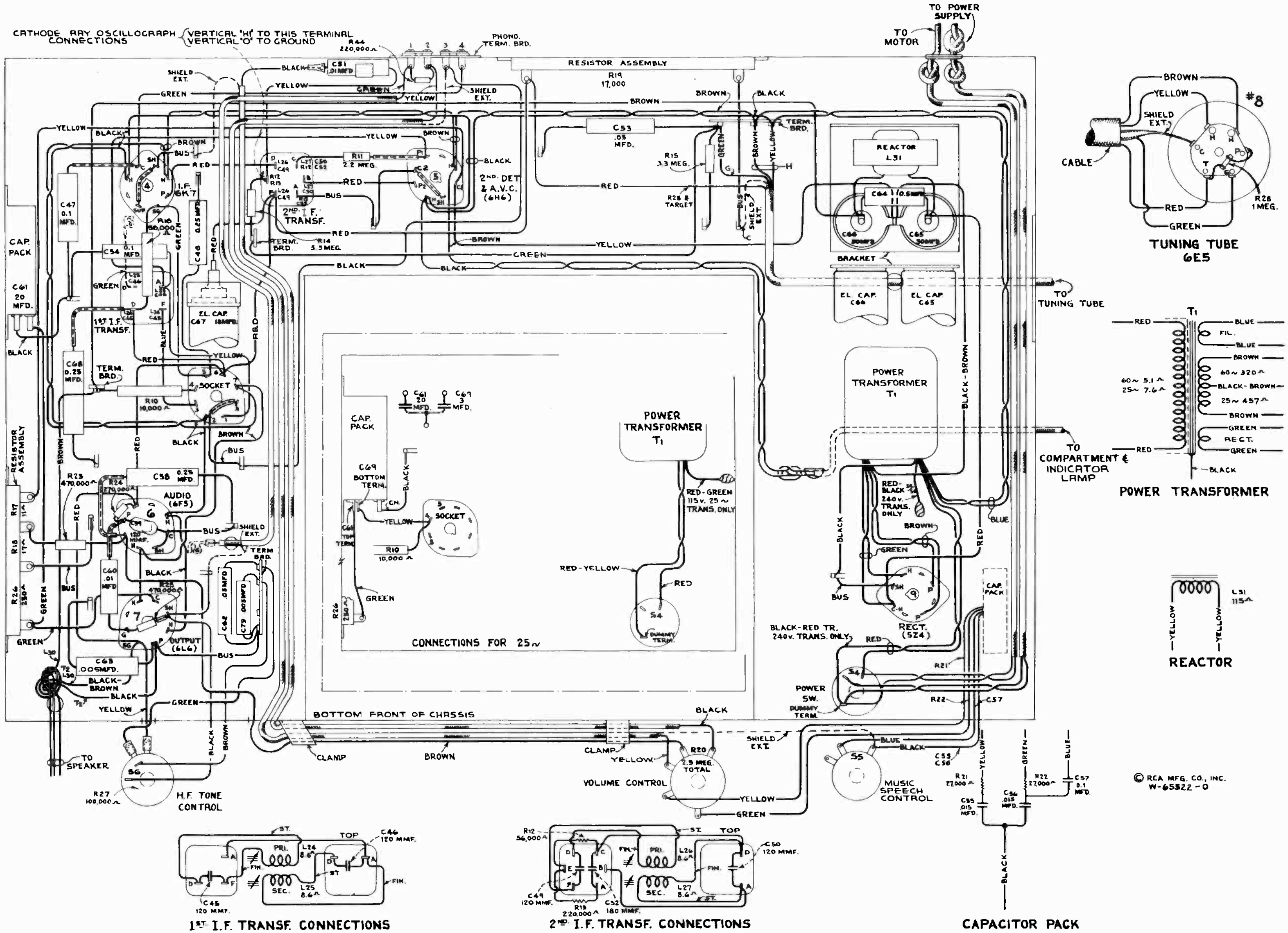


Figure 3—Chassis Wiring Diagram (Less "Magic Brain") Model 9U2

wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a ⅞-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted directly by the range selector. Any inductive effect of L16 is thus eliminated. L19,

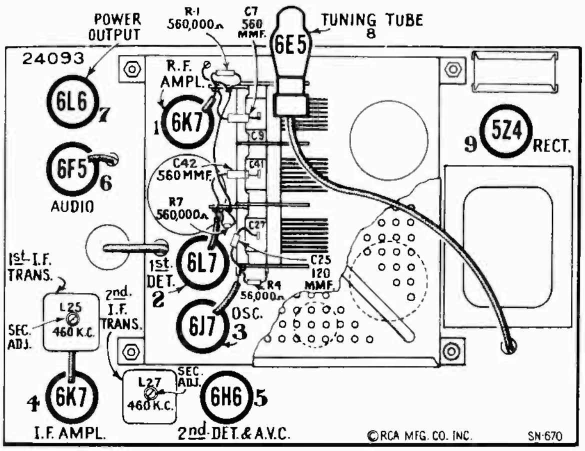


Figure 4—Radiotron and I-F Trimmer Locations

L18, and L17 are shorted directly by the range selector.

Separate windings, with the exception of L23, are employed in the oscillator stage for each position of the range selector. L23 (inductively coupled to L11 and L12) is placed in the oscillator plate circuit to provide additional feed-back when operating receiver on the "Ultra short wave" (D) band. This coil is effectively r-f bypassed by capacitor C12, when range selector is in the "Short wave" (C) position, to prevent undesirable reactions. Its effect on the remaining bands is negligible. The inherent stability of the oscillator circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to grid No. 3 of the RCA-6L7 first detector.

The output of the "Magic Brain" is fed to the i-f amplifier through a plug-in cable. This cable also supplies all power required by the "Magic Brain" unit.

I-F Amplifier

The intermediate-frequency amplifier consists of an RCA-6K7 in a transformer-coupled circuit. The windings of these transformers are resonated with fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R12 and R13, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R11, R12, and R13, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the No. 1 diode ceases to draw current and the a.v.c. diode takes over the biasing function.

Audio System

The manual radio volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6F5 audio voltage-amplifier tube. This control has a two-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6L6 power output tube. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S5 which, in the "Speech" position, places an additional capacitor C57 in shunt with the capacitor C56 in one of the tone-compensating filters. This reduces the low-frequency response of the amplifier and provides maximum intelligibility of the voice frequencies.

The high-frequency tone control consists essentially of the combinations of capacitor C62 and variable resistor R27, capacitor C79 and switch S6 shunting the plate circuit of the output tube. When the tone control is in its extreme counter-clockwise position the resistance of R27 is a minimum, making capacitor C62 most effective, and switch S6 remains closed, connecting capacitor C79 across the plate circuit, providing maximum attenuation of the higher audio frequencies. As the control is turned clockwise, placing more resistance in series with capacitor C62, this capacitor becomes less and less effective and the upper frequency range of the audio amplifier is extended. When the tone control nears its extreme clockwise position, resistor R27 and switch S6 open, removing capacitors C62 and C79 respectively from the audio circuit, thereby increasing the higher audio frequency range of the system.

Phonograph

The electrical impulses generated in the pickup coil L42 are boosted in the input transformer T3 before they are fed to the input grid of the RCA-6F5 audio voltage-amplifier tube through the acoustically tapered phonograph volume control R39. The phonograph volume control also functions as a radio-phono transfer switch (see Schematic Diagram, figure 1). In the extreme counter-clockwise (radio) position, switch S8 is closed, completing the cathode circuit of the RCA-6K7 i-f amplifier tube, and the movable arm "X" (which is connected to the input grid of the RCA-6F5 through coupling capacitor C84) contacts lug "Y" (which is connected to the movable arm of the radio volume control R20), permitting normal radio reception. As the phonograph control is rotated clockwise, switch S8 is immediately opened (opening the i-f cathode circuit and making the i-f amplifier inoperative), and the movable arm "X" slides over the tapped resistance strip, thereby functioning as a phonograph volume control. A compensation filter is placed in shunt with the output of transformer T3 to correct the frequency response of the reproducing system so as to compensate for the recording characteristic.

Automatic Record Changer

An improved automatic mechanism, employing a synchronous motor, is used in these models. It is of the record ejector type, having a record capacity of seven for the ten-inch type, and a capacity of six for the twelve-inch type. The turntable speed is fixed at 78 r.p.m. by the design of the drive motor and the intermediate gear mechanism. *This speed is invariable and does not vary as long as the supply line frequency remains constant.* The instrument may be purchased with any one of several ratings as specified under Electrical Specifications. *It is very important that a machine of any particular rating be operated at the voltage and frequency for which it is designed and rated.* Attempts to operate on other voltages or frequencies will result in improper reproduction from the phonograph system and possible damage to the equipment. The ejecting mechanism is arranged so that it will trip on various types of records. This is obtained by having a trip mechanism which is actuated by the rate of needle acceleration toward the center of the record.

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. A portion of the signal voltage developed across resistor R13 is used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by the minimum width of the dark sector on the fluorescent screen.

"Magic Voice"

These instruments are designed with cabinets incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker, giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and four adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining seven adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instrument will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 7. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 7. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are **920 kc** apart) produce a signal. The low-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency **460 kc** below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment

(Refer to Figure 5)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C-10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of these receivers. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response (with the exception of the wave-trap) and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 6. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 11. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Turn range selector to its "Standard broadcast" (A) position and tune receiver to a position of no extraneous signals near **600 kc.** Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should

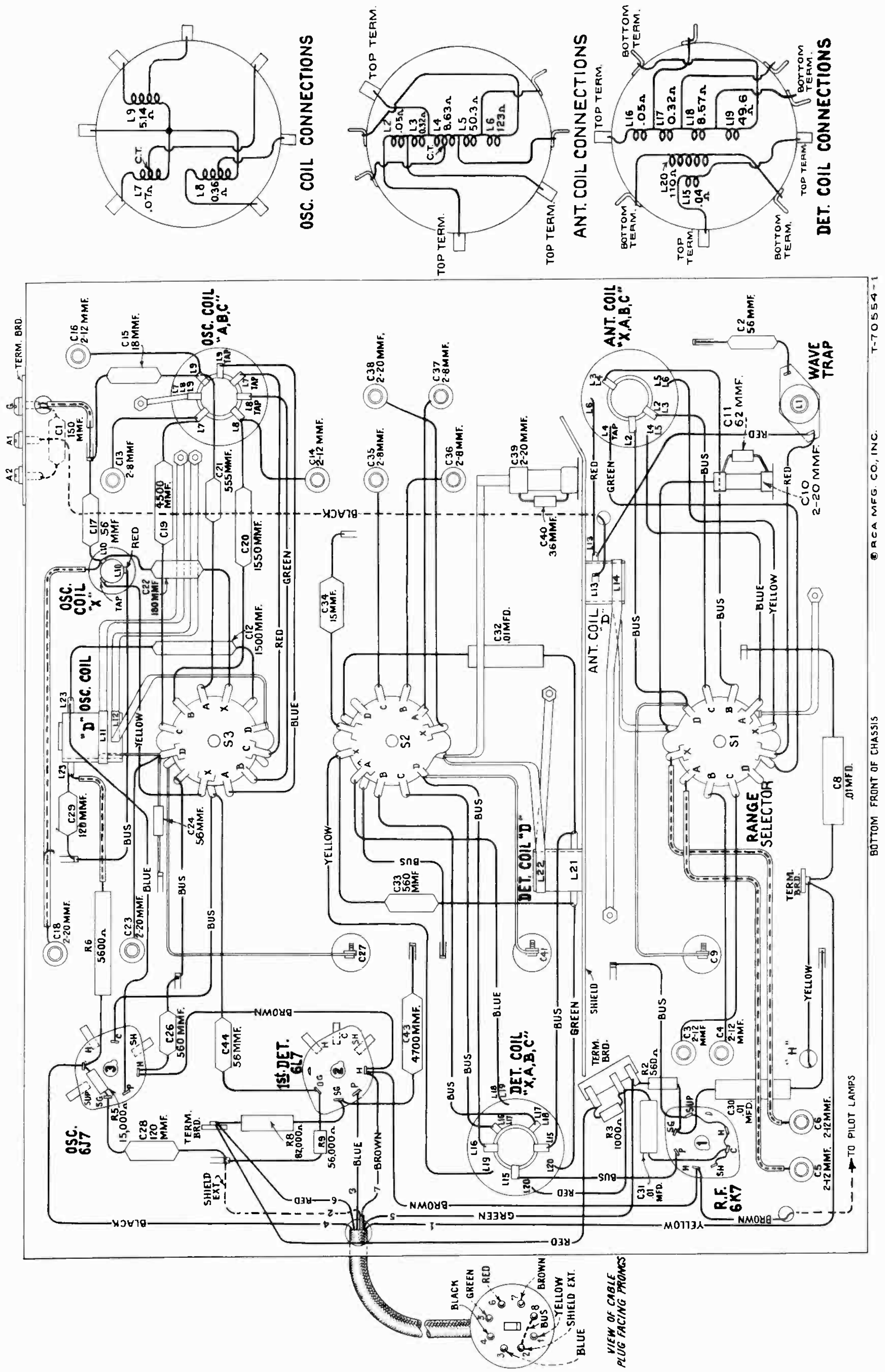


Figure 5—"Magic Brain" Wiring Diagram

be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L27** and **L26** (see figures 4 and 11) of the second i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack.

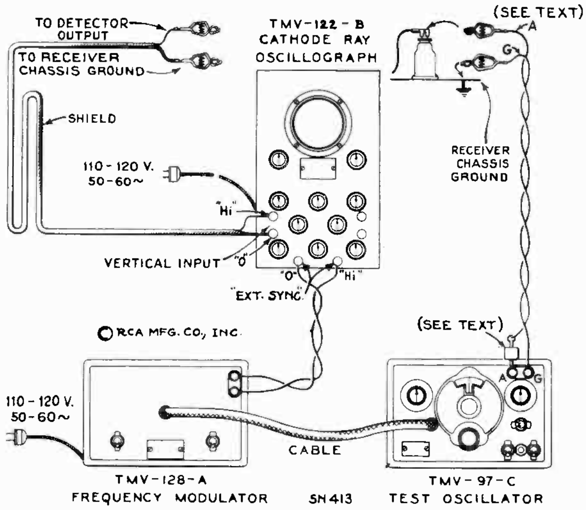


Figure 6—Alignment Apparatus Connections

Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L27** and **L26** on the second i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the RCA-6L7 first-detector grid cap, through a **.001-mfd.** capacitor (with grid lead in place). Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude. The composite wave obtained in this manner represents the resonance characteristic of the total i-f system. Lack of symmetry or irregularity of the resultant image will indicate the presence of a defect in the i-f system.

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 12. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

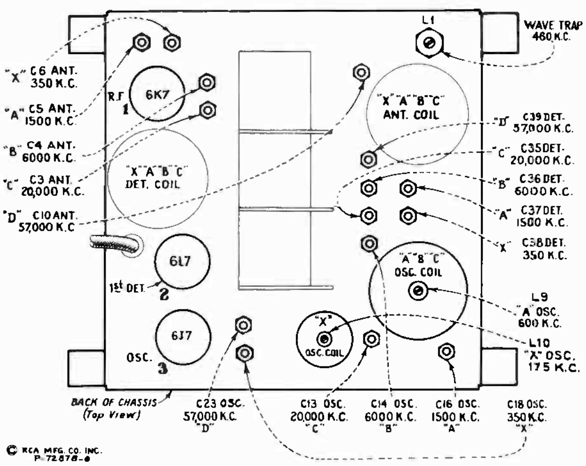
"Wave-Trap" Adjustment

(a) Connect the output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important).** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment. If the indication on the oscillograph screen is not sufficient for the following adjustments at **57,000 kc,** the vertical-input terminals of the cathode-ray oscillograph may be connected thus: "Hi" to the plate contact of the RCA-6L6 power-output tube socket with the "0" terminal to chassis-ground. The receiver should be turned off while making this connection since the plate potential is impressed across the oscillograph input and a severe shock will result if contact is made between these two points. If this connection is made, advance the receiver volume control to its maximum position. Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of



APPROX. DISTANCE IN INCHES—CHASSIS BASE TO TOP OF TRIMMER PLUNGER

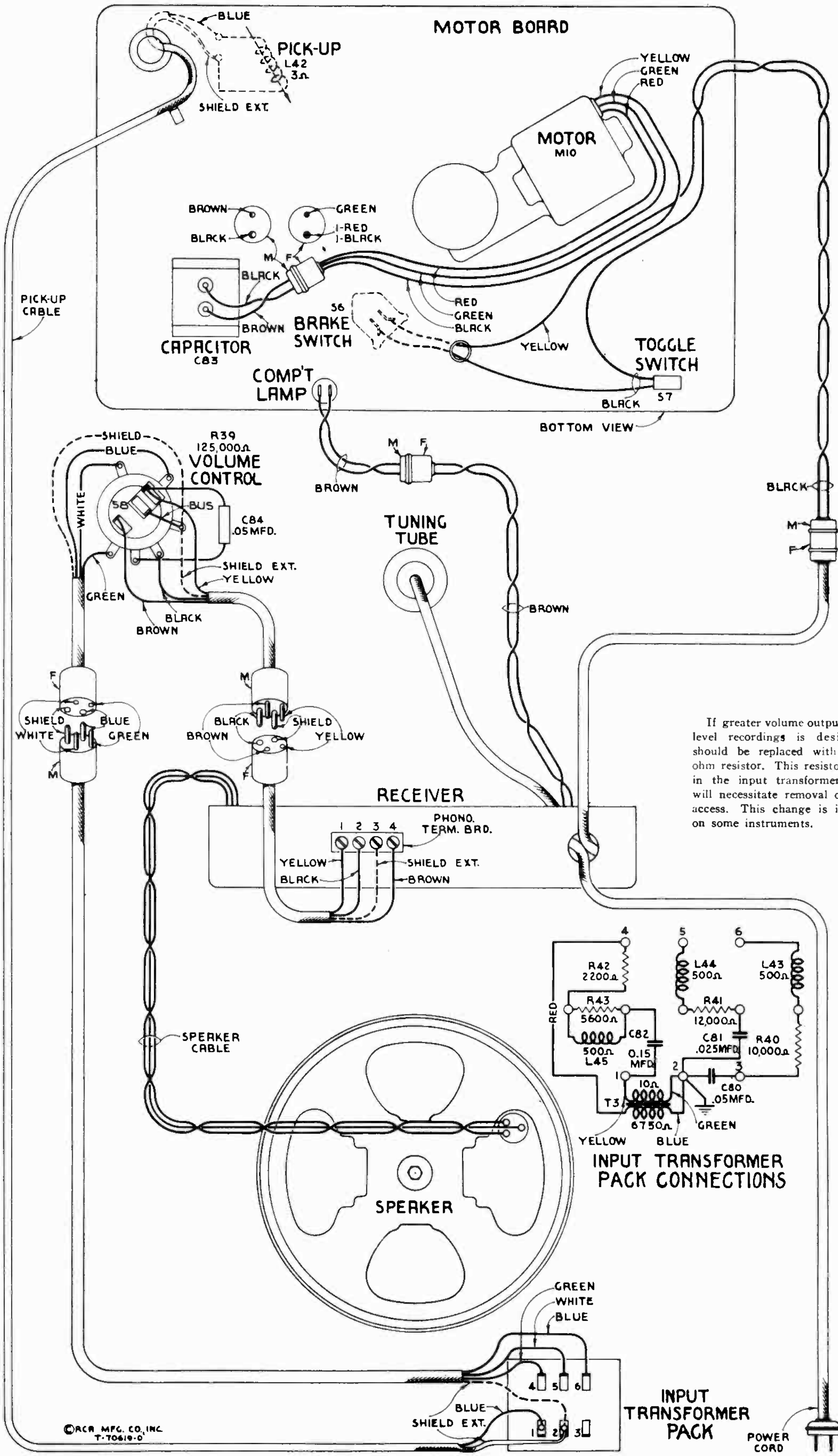
BAND	OSC.	DET.	ANT.
D	1 1/2	1 3/8	1 5/8
C	1 5/16	1 1/8	1 1/16
B	1 3/8	1 1/8	1 3/8
A	1 1/2	1	1 1/4
X	1 1/2	1 15/16	1 9/16

Figure 7—"Magic Brain" Trimmer Locations

test oscillator used). Two test-oscillator settings (**230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc**) without altering test-oscillator adjustment. Test-oscillator second harmonic of **14,250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater than **28,500 kc,** the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of **L11** and **L12** (see figure 5) nearer chassis. **Do not allow straps to touch chassis except where connected.** To increase inductance, move the straps farther away from chassis. Adjust position of straps till maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 5). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** If the vertical input cathode-ray connections were changed for adjustment (b) above, they should be restored to their original position as shown on figure 11. Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacity (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080**



If greater volume output from low-level recordings is desired, R-42 should be replaced with a 10,000-ohm resistor. This resistor is located in the input transformer pack and will necessitate removal of cover for access. This change is incorporated on some instruments.

Figure 8—Assembly Wiring

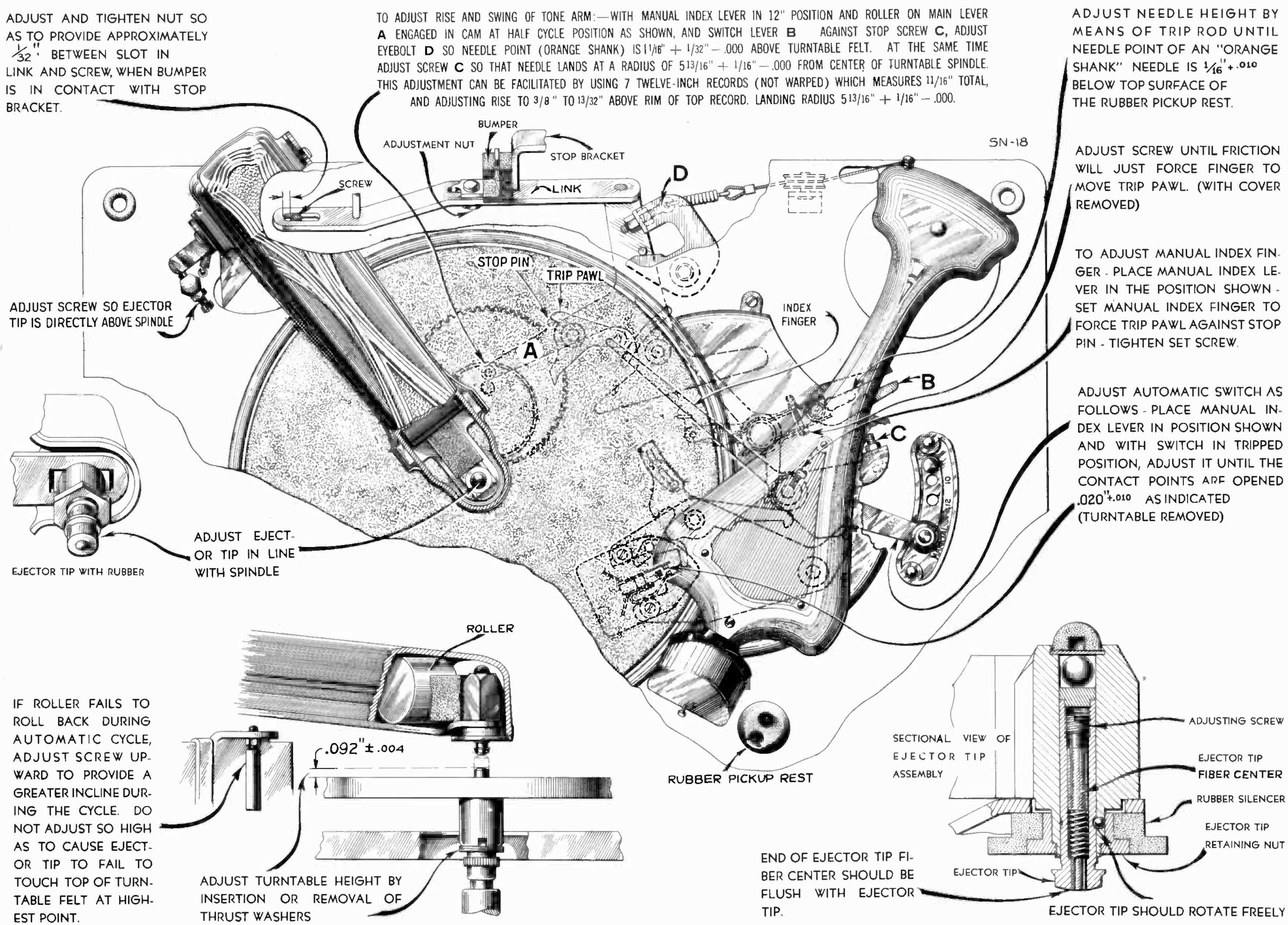


Figure 9—Automatic Record Changer Adjustments

kc. The image signal should be received at this position indicating that the adjustment of C13 has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to 6,000 kc. Tune the test oscillator to 6,000 kc. Adjust oscillator air-trimmer C14 to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer C36 for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C4 to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw L9 (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500—3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37** and **C5,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

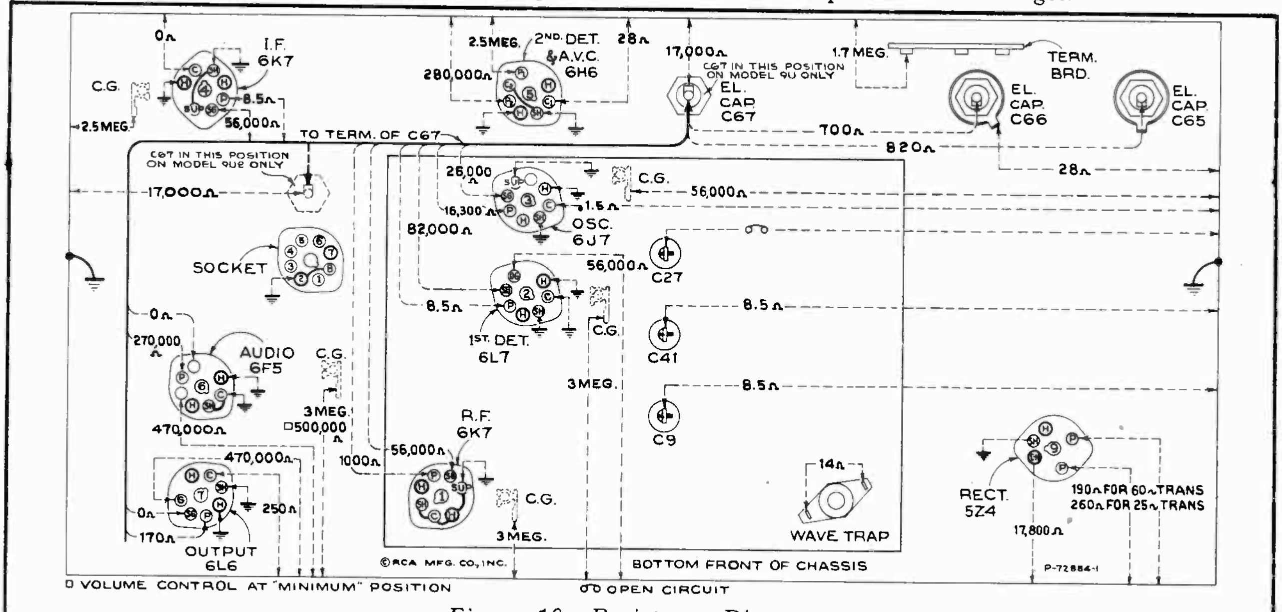


Figure 10—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Radio volume control clockwise—Phono volume control extreme counter-clockwise—Other controls optional

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent points on figure 10, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagrams, figures 2, 3 and 5, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to 200 kc (200—400-kc range). Tune receiver for maximum response to this signal at a dial reading of **approximately** 600 kc. The third harmonic of the 200-kc signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately** 230 kc. Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw L9 (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of L9 core, tightening lock nuts on C16, C37, and C5, respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to 175 kc. Tune the

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F	8.0 ma.
(2)	RCA-6L7—1st Det.	4.4 ma.
(3)	RCA-6J7—Osc.	6.7 ma.
(4)	RCA-6K7—I.F.	8.0 ma.
(5)	RCA-6H6—2nd Det.-A.V.C.	—
(6)	RCA-6F5—A.F.	0.3 ma.
(7)	RCA-6L6—Power	63 ma.
(8)	RCA-6E5—Eye	3.0 ma.
(9)	RCA-5Z4—Rect.	110 ma.*

(*Cannot be measured at socket)

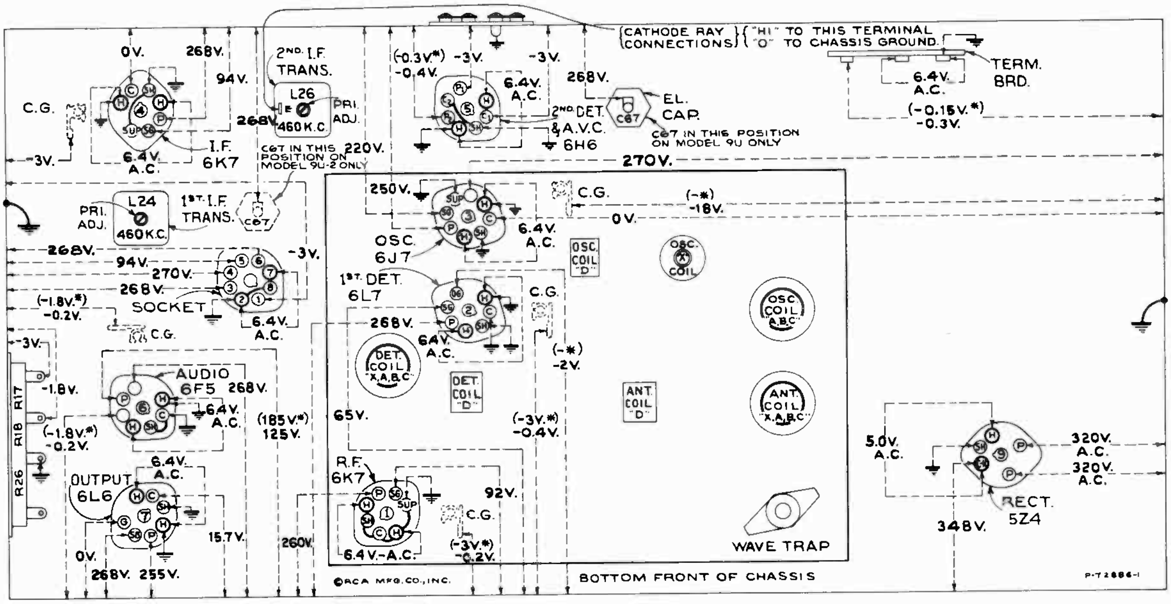


Figure 11—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Radio volume control counter-clockwise—Phono volume control extreme counter-clockwise—Other controls optional

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parenthesis because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 11 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

test oscillator to 175 kc and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the images and best coincidence throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Selector Dial

Figure 12 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch in in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

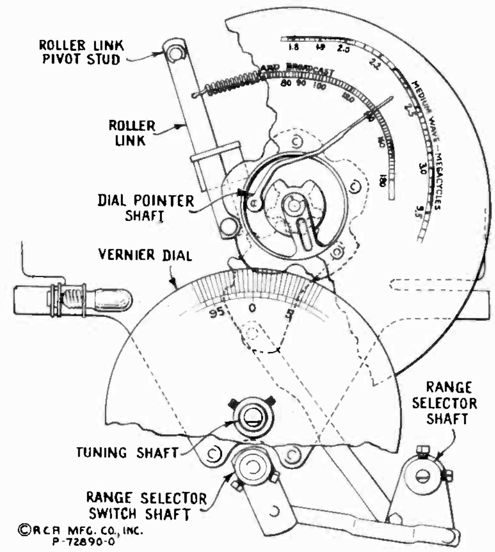


Figure 12—Selector Dial Change Mechanism

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

Centering Armature

Refer to figure 13 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly cleaned with fine emery cloth. Then insert the new block so that it occupies the same position at it did originally. Make certain that the block is in correct

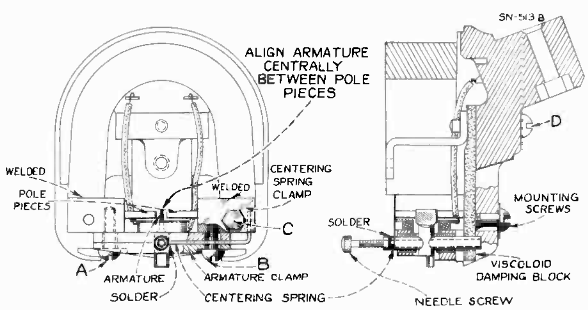


Figure 13—Details of Pickup

vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in figure 14 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to re-adjust the armature as previously explained after re-assembly of the mechanism. Only rosin core

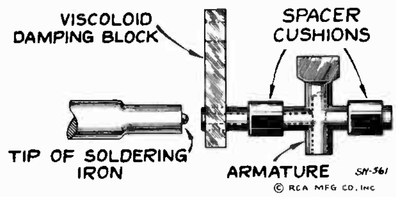


Figure 14—Special Soldering-Iron Tip

solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

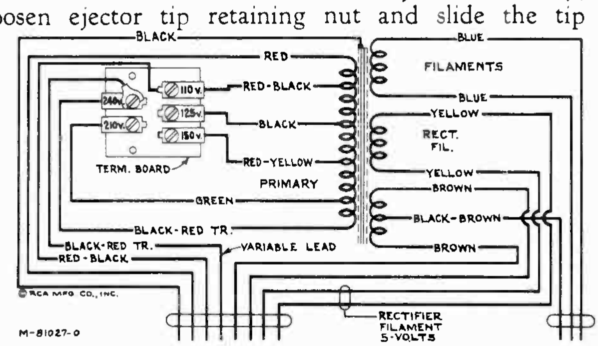
Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

Automatic Record Ejector

The record changing mechanism is designed to be simple and fool-proof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 9.

It is important when servicing the automatic mechanism, to have it placed on a level support. It is also important to refrain from forcing the mechanism if there is a tendency to bind or jam, since bent levers and possibly broken parts may result.

The tip of the record ejector is adjustable in relation to the turntable spindle, the two being exactly coaxial when properly adjusted. To align the tip, remove the rubber silencer of the ejector assembly, loosen ejector tip retaining nut and slide the tip



Primary resistance—10 ohms total
Secondary resistance—266 ohms total

Figure 15—Universal Transformer

assembly to the position where it is in true-line with the axis of the turntable spindle. This adjustment may be simplified by placing several records on the turntable, depressing the spindle through the top record hole and lining up the ejector tip in the spindle hole of the record.

To insure that the ejector tip rotates freely, apply a slight amount of oil to the shank of the tip at the point where it is in contact with the ball bearing.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone using care not to allow

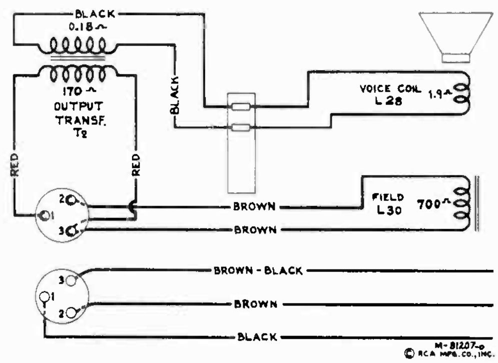


Figure 16—Loudspeaker Wiring

the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12863	Board—4 contact and 2 link phonograph terminal board	.25
4427	Bracket—Mounting bracket for H.F. tone control, L.F. tone control or volume control	.18
12867	Cable—Tuning lamp cable and socket	1.70
13230	Cable—2 conductor compartment and pilot lamp cable (chassis end) approx. 34-in. long complete with two female connectors Stock No. 11488—Model 9U2 only	1.30
12511	Cap—Grid contact cap—Package of 5	.15
12859	Capacitor Pack—Comprising two sections .015 Mfd., one section .1 Mfd., and two resistors 27,000 ohms each (C55, C56, C57, R21, R22)	1.50
12873	Capacitor Pack—Comprising one 3 Mfd. and one 20 Mfd. section used in 25 cycle Model only (C61, C69)	1.20
12724	Capacitor—120 Mmfd. (C59)	.28
12404	Capacitor—120 Mmfd. (C45, C46, C49, C50)	.26
12406	Capacitor—180 Mmfd. (C52)	.26
4838	Capacitor—.005 Mfd. (C63, C79)	.20
4624	Capacitor—.01 Mfd. (C51)	.54
4858	Capacitor—.01 Mfd. (C60)	.25
4836	Capacitor—.05 Mfd. (C53)	.30
4886	Capacitor—.05 Mfd. (C62)	.20
4841	Capacitor—0.1 Mfd. (C54)	.22
11414	Capacitor—0.1 Mfd. (C47)	.20
4840	Capacitor—.25 Mfd. (C58)	.30
5170	Capacitor—.25 Mfd. (C48, C68)	.25
12741	Capacitor—0.5 Mfd. (C64)	.30
5212	Capacitor—18 Mfd. (C67)	1.16
12872	Capacitor—20 Mfd. (C61)	.90

Stock No.	Description	List Price
12467	Capacitor—30 Mfd. (C65, C66)	1.40
5119	Connector—3-contact female connector for speaker leads	.25
4573	Connector—2-contact female connector for motor cable (Chassis End)	.30
11488	Connector—2-contact female connector for phonograph compartment lamp cable (Chassis End)	.14
12006	Core—Adjustable core and stud for Stock No. 12652 and 12653	.22
12870	Dial—Vernier dial and disc assembly	.65
4340	Lamp—Dial lamp 6.3 volt, lower R.H. socket Model 9U2 only—Package of 5	.60
5226	Lamp—Dial lamp, 6.3 volt—Package of 5	.70
12868	Link—Range switch and band indicator operating link complete with set screw	.45
12871	Reactor—Filter reactor (L31)	1.50
12865	Resistor—Voltage divider resistor—Comprising one section 250 ohm, one section 17 ohm, and one section 11 ohm (R17, R18, R26)	.45
12876	Resistor—10,000 ohms—wire wound—10 watt (R10)	.55
12864	Resistor — 17,000 ohms — wire wound (R19)	.70
11282	Resistor—56,000 ohms—carbon type—1/10 watt (R12)—Package of 5	.75
12875	Resistor—56,000 ohms—carbon type—1 watt (R16)—Package of 5	1.10
12264	Resistor—220,000 ohms — insulated — 1/4 watt (R44)—Package of 5	1.00
11398	Resistor—220,000 ohms—carbon type—1/10 watt (R13)—Package of 5	.75
11453	Resistor—270,000 ohms—carbon type—1/10 watt (R24)—Package of 5	.75
11172	Resistor—470,000 ohms—carbon type—1/4 watt (R23)—Package of 5	1.00

Prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
11452	Resistor—470,000 ohms—carbon type—1/10 watt (R25)—Package of 5	.75
12013	Resistor—1 Megohm—carbon type—1/10 watt (R28)—Package of 5	.75
11626	Resistor—2.2 Megohm—carbon type—¼ watt (R11)—Package of 5	1.00
12874	Resistor—3.3 Megohm—carbon type—¼ watt (R14, R15)—Package of 5	1.00
4669	Screw—No. 8-32-5/32 set screw for link Stock No. 12868—Package of 10	.25
3903	Screw—No. 8-32-3/16 headless cup point set screw for Stock No. 12870—Package of 20	.36
12869	Shaft—Range switch and band indicator operating shaft and hub—assembly	.25
12008	Shield—I.F. transformer shield for Stock No. 12652, 12653	.28
12607	Shield—I.F. transformer shield top for Stock No. 12652	.30
12581	Shield—I.F. transformer shield top for Stock No. 12653	.36
12110	Shield—Shield cap for 6F5 Radiotron	.14
13095	Socket—Dial lamp socket, upper left or lower right hand	.25
11222	Socket—Dial lamp socket, upper right or lower left hand	.18
11381	Socket—Tuning lamp socket and cover	.45
11195	Socket—5-contact 5Z4 Radiotron socket	.15
11198	Socket—7-contact 6H6, 6K7, 6L6, or 6F5 Radiotron socket	.15
11196	Socket—8-contact socket for R.F. Unit power cable plug	.15
12007	Spring—Retaining spring for Stock No. 12006	.36
12860	Tone Control—Low frequency tone control and power switch (S4, S5)	1.50
13468	Tone Control—High frequency tone control (R27, S6)	1.50
12652	Transformer—First I.F. transformer complete (L24, L25, C45, C46)	1.60
12653	Transformer—Second I. F. transformer complete (L26, L27, C49, C50, C52, R12, R13)	2.06
12856	Transformer—Power transformer, 105-125 volt, 50-60 cycle (T1)	5.35
12857	Transformer—Power transformer, 105-125 volt, 25 cycle (T1)	7.10
12858	Transformer—Power transformer, 100-250 volt, 50-60 cycle (T1)	8.75
12861	Volume Control—(R20)	1.00
	MAGIC BRAIN UNIT ASSEMBLIES	
12806	Board—3-contact antenna and ground terminal board	.25
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12886	Cable—Shielded power cable approx. 4-in. long complete with 8-contact male plug	1.50
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	.38
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20

Stock No.	Description	List Price
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1,500 Mmfd. (C12)	.20
12729	Capacitor—1,550 Mmfd. (C20)	.26
12728	Capacitor—4,500 Mmfd. (C19)	.36
12897	Capacitor—4,700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield, XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil, "D" band (L13, L14)	.60
12880	Coil—Detector coil and shield, XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield, ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield, X band only (L10)	.80
12890	Coil—Oscillator coil, "D" band (L11, L12, L23)	.70
12889	Coil—R.F. coil, "D" band (L21, L22)	.65
12877	Condenser—3-gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8-contact male connector and cover for power cable, Stock No. 12886	.40
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
11324	Resistor—560 ohms — carbon type — ¼ watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type—¼ watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms — carbon type — 1 watt (R6)	.22
3998	Resistor—15,000 ohms—carbon type, ¼ watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms — carbon type — 1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—carbon type, ½ watt (R8)—Package of 5	1.00
11397	Resistor—560,000 ohms—carbon type—1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stock Nos. 12879 and 12880	.22
12710	Shield—Coil shield for Stock No. 12709	.28
12883	Shield—Coil shield for stock No. 12881	.20
11198	Socket—7-contact 6K7 Radiotron socket	.15
11279	Socket—7-contact 6L7 Radiotron socket	.20
12885	Socket—8-contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core, Stock Nos. 12664, 12800, 12882—Package of 10	.36
12878	Switch—Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave-trap, complete (L1)	.75
	DRIVE ASSEMBLIES	
10705	Ball—5/32-inch diameter steel ball for planetary drive—Package of 20	.25
10941	Ball—⅛-inch diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly, complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05

Prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12899	Drive—Variable tuning condenser drive, complete, including mounting bracket, drive, dial scale and indicator, less vernier dial, Stock No. 12870, and link, Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear, complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly, complete with spring	.30
12911	Screen—Dial lamp and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear, Stock Nos. 12905 and 12906—Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear, Stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link, Stock No. 8051—Package of 5	.32
	EJECT ARM ASSEMBLIES	
11541	Arm—Eject arm, complete	8.15
11533	Ball—1/16-inch diameter steel ball—Package of 10	.20
10129	Ball—3/16-inch diameter steel ball—Package of 20	.25
11529	Bearing—Ejector tip bearing and nut	.32
11538	Bracket—Eject arm bracket	1.72
11537	Collar—Eject arm shaft collar and set screw	.24
11540	Cover—Eject arm cover	1.52
11536	Cushion—Counter balance roller cushion located inside of eject arm	.14
4055	Post—Vertical adjustment post—located on eject arm bracket	.30
3729	Roller—Eject arm counter balance roller—located inside of eject arm	.45
4580	Screw—No. 6—32-3/16-inch square head set screw for eject arm collar—Package of 10	.25
11534	Screw—No. 8—36-7/32-inch special screw for eject arm tip center adjustment—Package of 10	.14
11535	Shaft and Collar—Eject arm vertical action shaft and collar assembly	.15
11528	Silencer—Ejector tip silencer	.14
4067	Spring—Ejector arm bracket spring—Package of 10	.30
11531	Spring—Ejector tip spring—Package of 10	.42
11530	Tip—Ejector tip with tip center, adjusting screw and cap	.32
11539	Yoke—Eject arm yoke assembly	.94
	PICKUP AND ARM ASSEMBLIES	
13469	Arm—Pickup arm, complete less pickup unit	6.00
11724	Armature—Pickup armature	.38
11548	Back—Pickup back	.52
4064	Cable—Pickup arm operating cable—Package of 5	1.00
11722	Coil—Pickup coil (L24)	.52
13470	Connector—Shielded pickup cable and connector assembly—approximately 59 inches long	.90
11545	Cover—Pickup front cover	.22
11546	Cover—Pickup back cover with mounting screws	.14
3737	Damper—Pickup damper—Package of 5	.65
3516	Damper—Damper assembly for pickup arm base—Comprising one upper and one lower damper, one upper bushing and one lower bearing	.14
11723	Escutcheon—Pickup arm escutcheon	.62
11721	Pickup—Pickup unit, complete	5.50
11549	Screw—Pickup front cover screw—Package of 10	.42
3387	Screw—Nut and washer for mounting pickup to arm—Package of 10	.50
11547	Screw—Pickup needle screw—Package of 10	.42
	OPERATING MECHANISM	
6502	Cam—Cam and gear assembly	1.18
6808	Clutch—Trip lever friction clutch	.30
11558	Cover—Metal cover for trip lever and friction finger assembly	.36
6809	Finger—Manual index lever finger assembly	.25
3670	Finger—Friction finger assembly	.32
11554	Lever—Manual index lever—less pin	.62
11556	Lever—Main lever and link assembly	2.10
11557	Lever—Main spring lever	.42
3677	Lever—Pickup arm cable lever assembly—Comprising lever with cable screw, spring and nut	.40
11555	Lever—Trip lever and friction clutch assembly	.94
6503	Pawl—Trip pawl assembly	.40
4124	Plate—Eject arm actuating plate assembly	.50
4563	Screw—Cable lever screw and nut—Package of 10	.60
4564	Screw—Manual index lever finger set screw—Package of 10	.20
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
11559	Spacer—Pickup arm mounting spacer	.28
4127	Spring—Actuating spring—Package of 10	.24
3666	Spring—Cable lever tension spring—Package of 10	.44
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
4061	Spring—Main spring lever tension spring—Package of 10	.38
2893	Spring—Trip lever latch plate tension—Package of 10	.30
2917	Washer—Spring washer—"U" type—Package of 10	.25
	MOTOR ASSEMBLIES	
9735	Motor—105-125 volts—25 cycles (M1)	49.50
9651	Motor—105-125 volts—50 cycles (M1)	35.35
9650	Motor—105-125 volts—60 cycles (M1)	35.35
12050	Suspension Spring—Motor mounting spring, washer, and stud assembly—Comprising six springs, six cup washers, three spring washers and three studs	.60
	AUTOMATIC SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 2 sets	.50
6805	Switch Assembly—Automatic switch, complete	1.90
3322	Switch—Motor switch (S6)	.75

Prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
	MOTOR BOARD ASSEMBLIES	
11881	Base—Phonograph compartment lamp socket and base	.55
12051	Capacitor—2 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9650 or No. 9651 only (C83)	4.18
13101	Capacitor—4 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9735 only (C83)	5.05
4674	Connector—2-contact male connector for Stock Nos. 12051, 13101 or phono compartment lamp leads	.25
4577	Connector—2-contact male connector motor cable	.30
11488	Connector — 2-contact female connector for motor leads	.14
11542	Cover—Turntable cover	.88
11553	Escutcheon—Index escutcheon engraved "Manual—12—10"	.44
4340	Lamp—Phonograph compartment lamp—6.3 volts—Package of 5	.60
3764	Nut—Cap nut for motor board suspension assembly—Package of 4	.40
3672	Pin—Manual index pin	.42
11551	Rest—Pickup rest	.14
3654	Roller—Pickup arm cable guide roller—Comprising bracket, roller and guide pin	.34
11711	Shade—Phonograph compartment lamp shade	.16
3763	Suspension Spring — Suspension spring, washer and bolt assembly for motor board—Comprising one bolt, two cup washers, two springs, two "C" washers and one cap nut	.42
4671	Switch — Operating switch — toggle type (S7)	.72
11599	Turntable—Complete	2.90
	MISCELLANEOUS CABLE ASSEMBLIES	
13226	Cable—3-conductor shielded compensator cable (volume control end), approximately 18 inches long, complete with one 4-contact female connector, Stock No. 12494	2.20
13227	Cable—3-conductor shielded compensator cable (transformer end), approximately 8 inches long, complete with one 4-contact male connector, Stock No. 12565 and three pin type terminals—for Model 9U2 only	1.45
13232	Cable—3-conductor shielded compensator cable (transformer end), approximately 27 inches long, complete with one 4-contact male connector, Stock No. 12565 and three pin type terminals—for Model 9U only	2.00
13225	Cable—3-conductor shielded volume control cable (chassis end), approximately 13 inches long, complete with one 4-contact female connector, Stock No. 12494—for Model 9U2 only	1.75
13228	Cable—3-conductor shielded volume control cable (control end), approximately 9½ inches long, complete with one 4-contact male connector, Stock No. 12565	1.55
13231	Cable—3-conductor shielded volume control cable (chassis end), approximately 24 inches long, complete with one 4-contact female connector, Stock No. 12494—for Model 9U only	2.00

Stock No.	Description	List Price
12494	Connector—4-contact female for cable, Stock Nos. 13225, 13226 or 13231	.18
12565	Connector — 4-contact male for cable, Stock Nos. 13227, 13228 or 13232	.20
	REPRODUCER ASSEMBLIES	
12914	Board—3-contact reproducer terminal board	.25
12640	Bracket — Output transformer mounting bracket and clamp assembly	.18
12912	Coil—Field coil (L30)	1.70
12667	Cone—Reproducer cone and dust cap (L28)	1.00
5118	Plug—3-contact male reproducer plug	.25
9736	Reproducer—Complete	8.70
12913	Transformer—Output transformer (T2)	1.45
11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
	MISCELLANEOUS ASSEMBLIES	
4391	Box—Used needle box	.70
11996	Bracket—Tuning lamp mounting bracket and clamp	.22
13103	Cap — Pilot lamp cap — Package of 5 — Model 9U2 only	.65
4836	Capacitor—.05 Mfd. (for phonograph volume control) (C84)	.30
12915	Crystal—Station selector escutcheon and crystal	1.30
11580	Cover — Pilot lamp cover — Model 9U2 only	.12
12742	Escutcheon—Tuning lamp escutcheon	.22
4340	Lamp—Pilot lamp—6.3 volts—Package of 5—Model 9U2 only	.60
12699	Knob—Large station selector knob—Package of 5	.68
11347	Knob—Low frequency tone control and power switch phonograph or radio volume control, range switch, or high frequency tone control knob — Package of 5	.75
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11607	Receptacle—Needle card holder	.38
11210	Screw—Chassis mounting screw assembly for Model 9U only—Package of 4	.28
4560	Screw—Chassis mounting screw assembly (front)—Comprising one screw, one washer and one lockwasher—Package of 10—Model 9U2 only	.30
13102	Screw—Chassis mounting screw assembly (bottom)—Comprising one screw, two cushions, one spacer, one washer and one lockwasher — Package of 2 — for Model 9U2 only	.30
12916	Shield—Complete R.F. unit shield	.90
11573	Socket—Pilot lamp socket—Model 9U2 only	.28
11349	Spring—Retaining spring for knob, Stock Nos. 11347 and 12700—Package of 5.	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
13415	Tube—Magic voice tube—7 inches long.	.35
13416	Tube—Magic voice tube—8 inches long.	.35
13417	Tube—Magic voice tube—9 inches long.	.35
13127	Transformer — Phonograph input transformer — Comprising one transformer, three choke coils, three capacitors and four resistors (T3, L43, L44, L45, C80, C81, C82, R40, R41, R42, R43)	6.40
13126	Volume Control — Phonograph volume control and switch (R39, S8)	1.50

Prices quoted above are subject to change without notice.

MICROPHONICS IN MAGIC BRAIN RECEIVERS

Cases of howl or microphonics on Models 9T, 10T or other receivers employing similar Magic Brain units, may be serviced by adhering to the following procedure: -

(1) Install a Stock No. 14617 RCA Flexible Socket Adaptor for the RCA-6J7 oscillator tube. This adaptor is readily attached by simply removing the tube, plugging the new unit into the 6J7 socket, and inserting the tube into the adaptor.

(2) Replace the RCA-6J7, choosing one with low microphonics.

IF SATISFACTORY PERFORMANCE IS NOT OBTAINED BY OPERATIONS (1) AND (2), THEN

(3) Remove chassis from cabinet and loosen Magic Brain under-shield to gain access to the Oscillator Coil ("A, B, C" --see 9T and 10T Service Notes, Figure 4). Using a small brush, apply Household Cement, Ambroid, or similar adhesive to the enameled leads on the inside of the oscillator coil form, so as to make them mechanically stable. The leads referred to connect to the terminal lugs. Allow about six hours for cement to dry before operating the receiver.

(4) If dial calibration or sensitivity is affected by the above operations, re-align the radio-frequency and oscillator circuits in accordance with standard Service Note procedure. This usually will not be necessary.

RCA VICTOR MODELS 10T and 10K

Ten-Tube, Five-Band, A-C, Superheterodyne Receivers

TECHNICAL INFORMATION

Electrical Specifications

Frequency Ranges

"Long Wave" (X)	150-410 kc
"Standard Broadcast" (A)	530-1,800 kc
"Medium Wave" (B)	1,800-6,400 kc
"Short Wave" (C)	6,400-23,000 kc
"Ultra Short Wave" (D)	23,000-60,000 kc

Alignment Frequencies

"Long Wave" (X)	175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B)	6,000 kc (osc., det., ant.)
"Short Wave" (C)	20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D)	57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

Radiotron Complement

(1) RCA-6K7	R-F Amplifier
(2) RCA-6L7	First Detector
(3) RCA-6J7	Oscillator
(4) RCA-6K7	First I-F Amplifier
(5) RCA-6K7	Second I-F Amplifier
(6) RCA-6H6	Second Detector and A.V.C.
(7) RCA-6F5	Audio Voltage Amplifier
(8) RCA-6L6	Power Output
(9) RCA-5Z4	Full-Wave Rectifier
(10) RCA-6E5	Tuning Tube

Pilot Lamps (4) .... Mazda No. 46, 6 3 volts, 0.25 ampere

Power Supply Ratings

Rating A	105-125 volts, 50-60 cycles, 120 watts
Rating B	105-125 volts, 25-60 cycles, 120 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 120 watts

Power Output

Undistorted	5 watts
Maximum	9 watts

Loudspeaker

Type	Electrodynamic
Impedance (v.c.)	3.4 ohms at 400 cycles

Mechanical Specifications

Cabinet Dimensions	Model 10T	Model 10K
Height	23 1/16 inches	41 inches
Width	18 3/16 inches	27 inches
Depth	12 9/16 inches	14 3/4 inches
Weights		
Net	48 pounds	86 pounds
Shipping	57 pounds	132 pounds

Chassis Base Dimensions .... 15 inches x 9 3/4 inches x 3 inches

Over-all Height of Chassis .... 9 1/4 inches

Operating Controls. (1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Fidelity

Tuning Drive Ratios .... 20 to 1 and 100 to 1

General Description

These receivers represent the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model 10T is a ten-tube, table-type, "Magic Brain" superheterodyne receiver with an eight-inch electrodynamic loudspeaker. Model 10K employs an identical radio chassis, is of the console-type, has a twelve-inch electrodynamic loudspeaker, and incorporates the newly developed "Magic Voice." Design features incorporated in these receivers include built-in doublet antenna coupler; "Magic Brain"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; two-stage i-f amplifier; beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; range-selector sensitivity control; fidelity control; two-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof electrodynamic loudspeaker.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave", "Short wave", and "Ultra short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, two i-f amplifier stages, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, a beam-type power-amplifier stage, a tuning indicator "Magic Eye", and a full-wave rectifier.

"Magic Brain"

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7

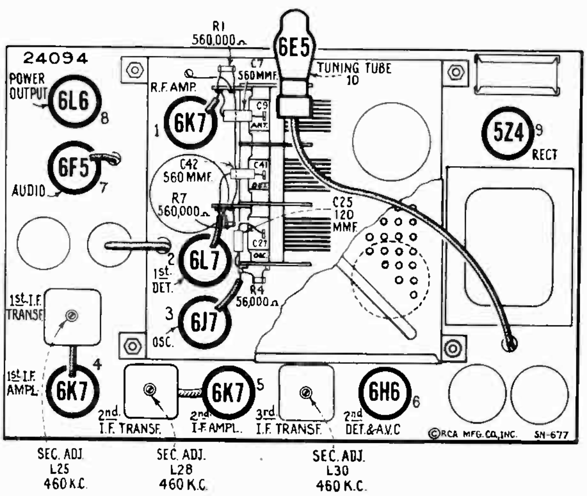


Figure 1—Radiotron and I-F Trimmer Locations

r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a 7/8-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted directly by the range selector. Any inductive effect of L16 is thus eliminated. L19, L18, and L17 are shorted directly by the range selector.

Separate windings, with the exception of L23, are employed in the oscillator stage for each position of the range selector. L23 (inductively coupled to L11 and L12) is placed in the oscillator plate circuit to provide additional feed-back when operating receiver on the "Ultra short wave" (D) band. This coil is effectively r-f bypassed by capacitor C12, when range selector is in the "Short wave" (C) position, to prevent undesirable reactions. Its effect on the remaining bands is negligible. The inherent stability of the oscillator circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to grid No. 3 of the RCA-6L7 first detector.

The output of the "Magic Brain" is fed to the i-f amplifier through the plug-in cable. This cable also supplies all power required by the "Magic Brain" unit.

I-F Amplifier

The intermediate-frequency amplifier consists of two RCA-6K7 tubes in a two-stage, transformer-coupled circuit. The windings of all three i-f transformers are resonated by fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc. A third winding L26, in the first i-f transformer, is placed in series with the main secondary L25 when the fidelity control switch S5 is thrown to "broad" position (see figure 2), thereby increasing the coupling between the primary and secondary circuits with consequent broadening of the band width of the i-f amplifier The increased band width of the i-f amplifier therefore causes less attenuation of the higher audio modulation side-band frequencies, permitting higher fidelity reception.

Detector and A.V.C.

The modulated signal, as obtained from the output of the last i-f stage, is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R17 and R19, is applied as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R18, R17, and R19, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The sensitivity of the receiver is increased in the "Ultra short wave" (D), "Short wave" (C), and "Medium wave" (B) bands by reducing the residual bias on the above mentioned controlled tubes with switch S7 which is operated by the range selector control.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6F5 audio voltage-amplifier tube. This control has a two-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6L6 power-output tube. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S6 which, in the "Speech" position, places an additional capacitor C66 and resistor R26 in shunt with the capacitor C65 in one of the tone compensating filters. This reduces the low-frequency response of the amplifier and provides maximum intelligibility of the voice frequencies.

Fidelity Control

The fidelity control consists essentially of the combination of a conventional high audio-frequency tone control, including capacitor C70 and variable resistor R29 in shunt with the plate circuit of the output tube, and means for changing the band width of the i-f amplifier. It performs in the following manner:

When the fidelity control is in its extreme counter-clockwise position, the resistance of R29 is a minimum, and winding L26 is disconnected from the i-f circuit (S5 in sharp position, see figure 2). Capacitor C70 is most effective at this point causing maximum attenuation of the higher audio frequencies. As the control is turned clockwise, placing more resistance in series with capacitor C70, the capacitor becomes less and less effective, and the upper frequency range of the audio amplifier is extended. When the fidelity control nears its extreme clockwise position, resistor R29 is disconnected and switch S5, operated by fidelity control shaft, places winding L26 (first i-f transformer) in series with L25 (S5 in broad position).

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. A portion of the signal voltage developed across resistor R19 is used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the

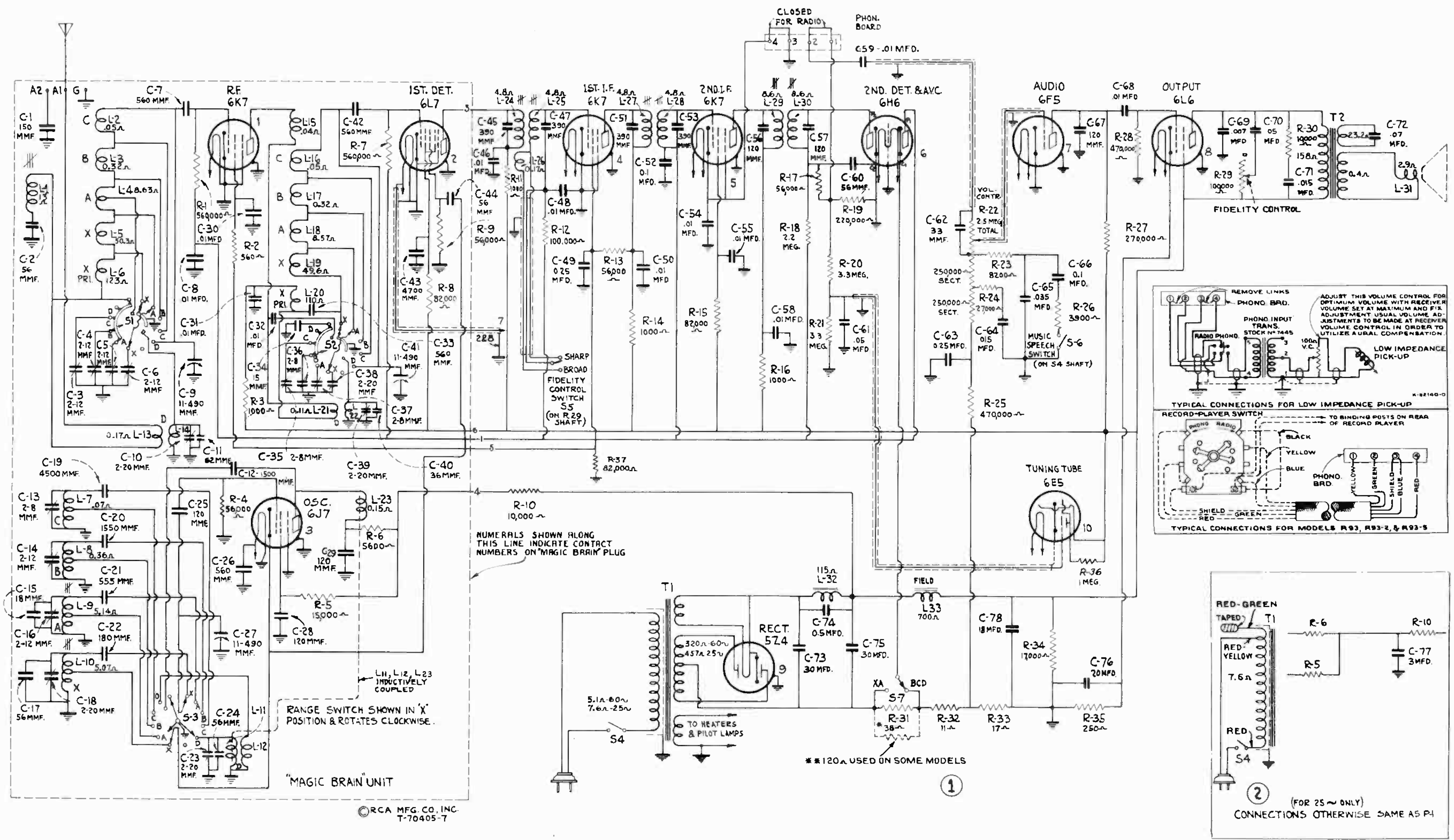


Figure 2—Schematic Circuit Diagram

(* Resistor R31 may be 56 ohms on some models. Replace with Stock No. 12980)
(** 120-ohm resistor not required when replacing resistor R31 with Stock No. 12980)

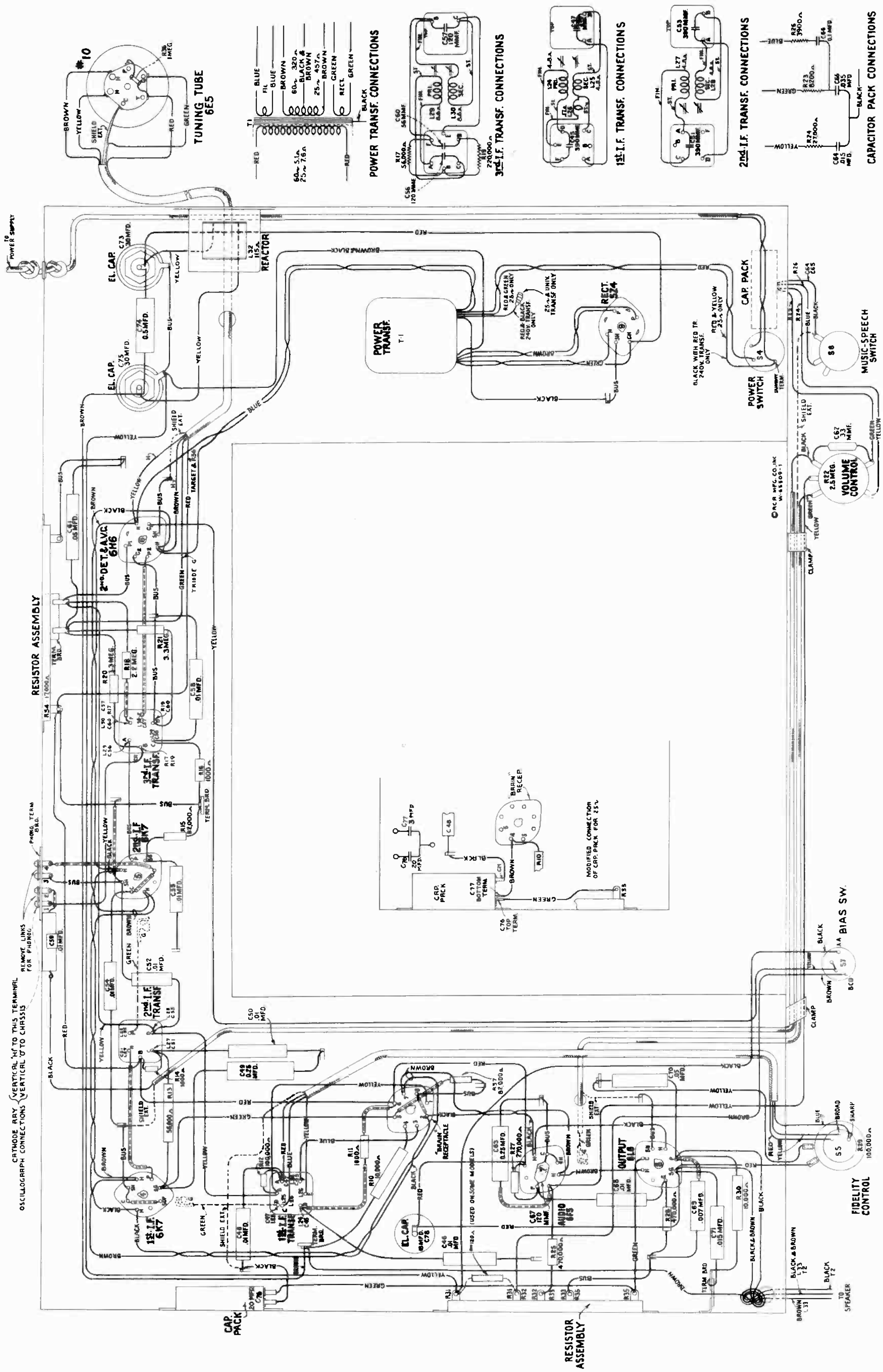


Figure 3—Chassis Wiring Diagram (Less "Magic Brain")

receiver is tuned to resonance with an incoming carrier. This condition is evidenced by the minimum width of the dark sector on the fluorescent screen.

"Magic Voice" (Model 10K)

Model 10K is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and six adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining nine adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of these receivers necessitates a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instruments will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 6. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment

(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 6. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are 920 kc apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency 460 kc below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is

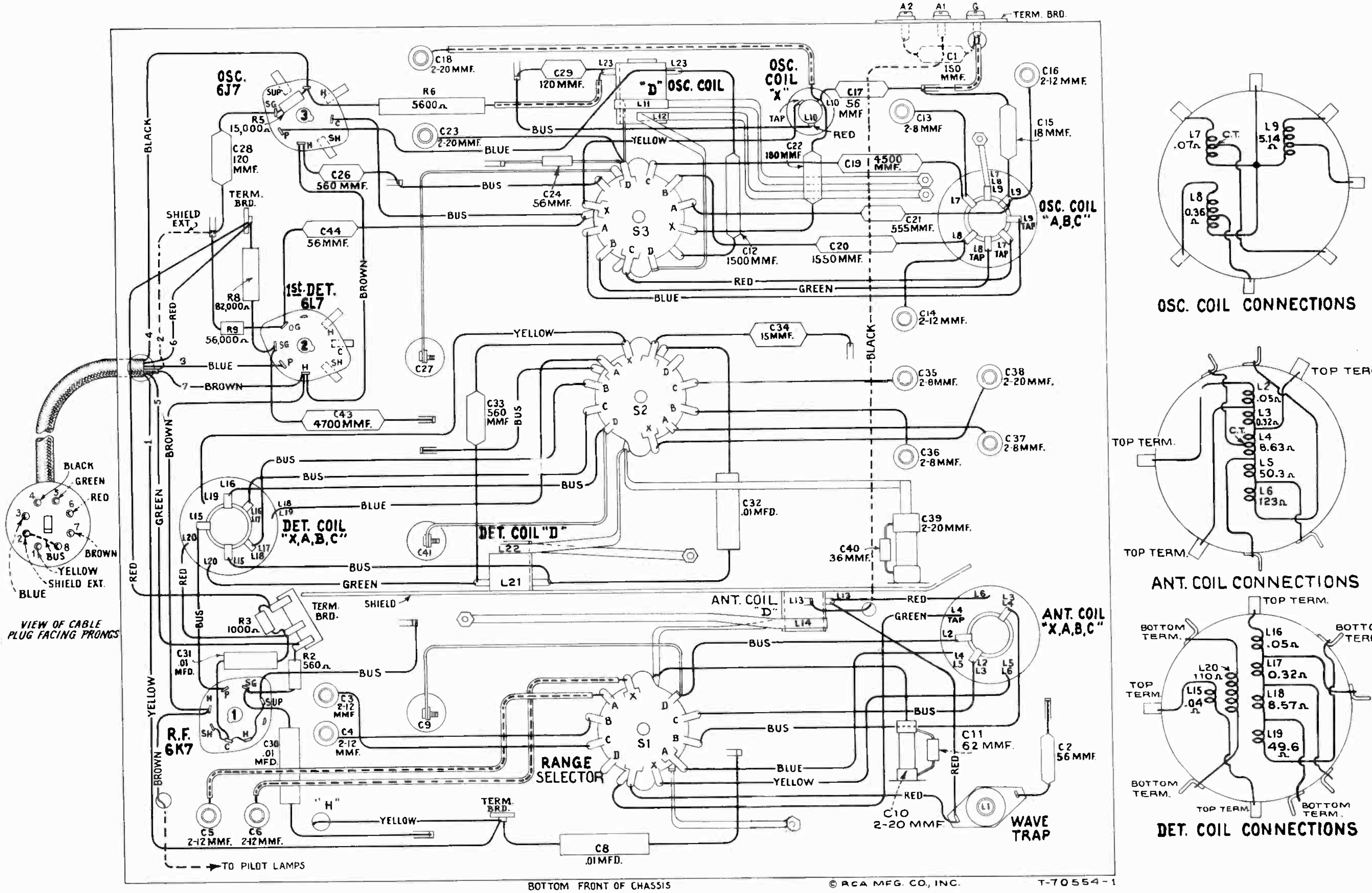


Figure 4—"Magic Brain" Wiring Diagram

decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of these receivers. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 5. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Set fidelity control to counter-clockwise position. Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 second i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi." Turn range selector to "A" band.

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be

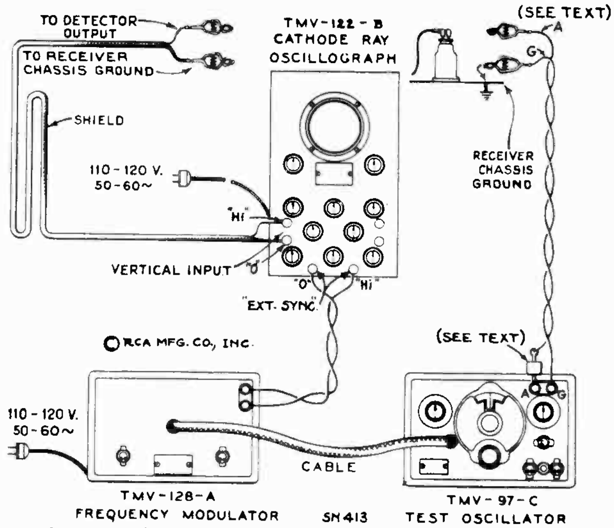


Figure 5—Alignment Apparatus Connections

observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L30** and **L29** (see figures 1 and 8) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L30** and **L29** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the RCA-6K7 first i-f tube (with grid lead in place), through a **.001-mfd.** capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two second i-f transformer magnetite core screws **L28** and **L27** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(i) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the RCA-6L7 first-detector, (with grid lead in place) through a **.001-mfd.** capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (h) above.

(j) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to become coincident throughout their lengths and have maximum amplitude.

(k) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn receiver fidelity control to extreme clockwise position. Note width of oscillographic image at a point which is 50% of maximum amplitude. Under normal conditions the latter measurement should be approximately 60% greater in width than the former measurement. The image should also appear slightly double humped. These conditions indicate proper broadening of the band width of the i-f amplifier. Turn range selector to "Medium wave" (B) band and note increase of amplitude. The amplitude should increase several times. It may be necessary to decrease output of test oscillator to keep image on screen. Turn receiver fidelity control to extreme counter-clockwise position and proceed to "R-F Adjustments."

R-F Adjustments

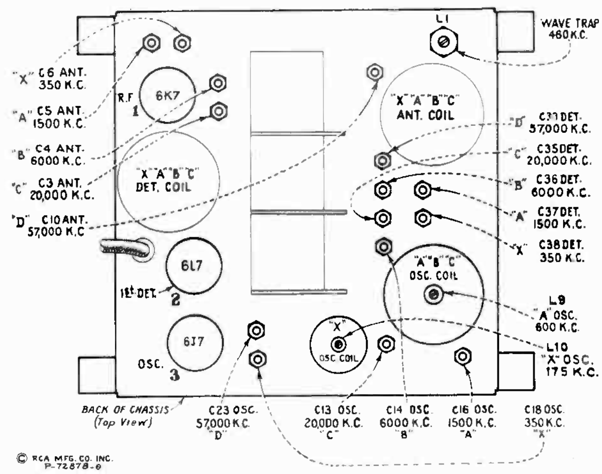
Make receiver dial adjustments as outlined by "Selector dial," figure 11. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment. If the indication on the oscillograph screen is not sufficient



APPROX. DISTANCE IN INCHES—CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT.
D	1 1/2	1 7/8	1 5/8
C	1 3/16	1 1/8	1 1/16
B	1 3/8	1 1/8	1 3/8
A	1 1/2	1	1 1/4
X	1 1/2	1 15/16	1 9/16

Figure 6—"Magic Brain" Trimmer Locations

for the following adjustments at **57,000 kc,** the vertical-input terminals of the cathode-ray oscillograph may be connected thus: "Hi" to the plate contact of the RCA-6L6 power-output tube socket with the "0" terminal to chassis-ground. The receiver should be turned off while making this connection since the plate potential is impressed across the oscillograph input and a severe shock will result if contact is made between these two points. If this connection is made, advance the receiver volume control to its maximum position.

Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings **(230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc)** without altering test - oscillator adjustment. Test - oscillator second harmonic of **14,250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater

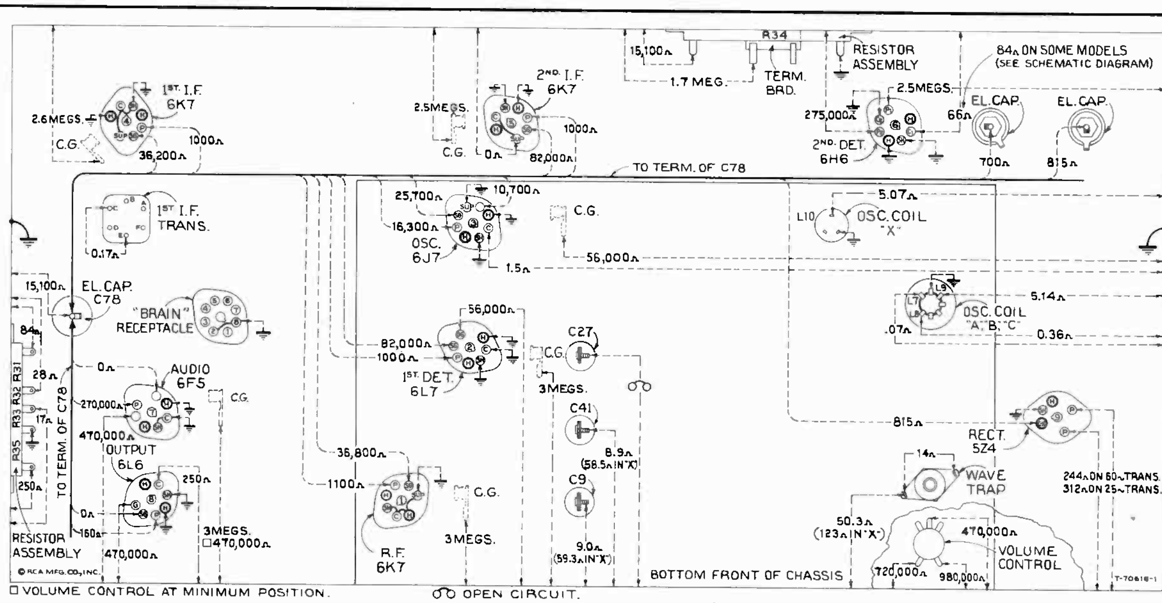


Figure 7—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum—Fidelity control counter-clockwise

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 7, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagrams, figures 3 and 4, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

than **28,500 kc**, the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of **L11** and **L12** (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

Radiotron Cathode Current Readings
Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F	4.6 ma.
(2)	RCA-6L7—1st Det.	3.0 ma.
(3)	RCA-6J7—Osc.	6.0 ma.
(4)	RCA-6K7—1st I.F.	5.0 ma.
(5)	RCA-6K7—2nd I.F.	7.0 ma.
(6)	RCA-6H6—2nd Det.-A.V.C.	—
(7)	RCA-6F5—A.F.	0.3 ma.
(8)	RCA-6L6—Power	65 ma.
(9)	RCA-5Z4—Rect.	110 ma.*
(10)	RCA-6E5—Eye	3.0 ma.

(* Cannot be measured at socket)

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.**

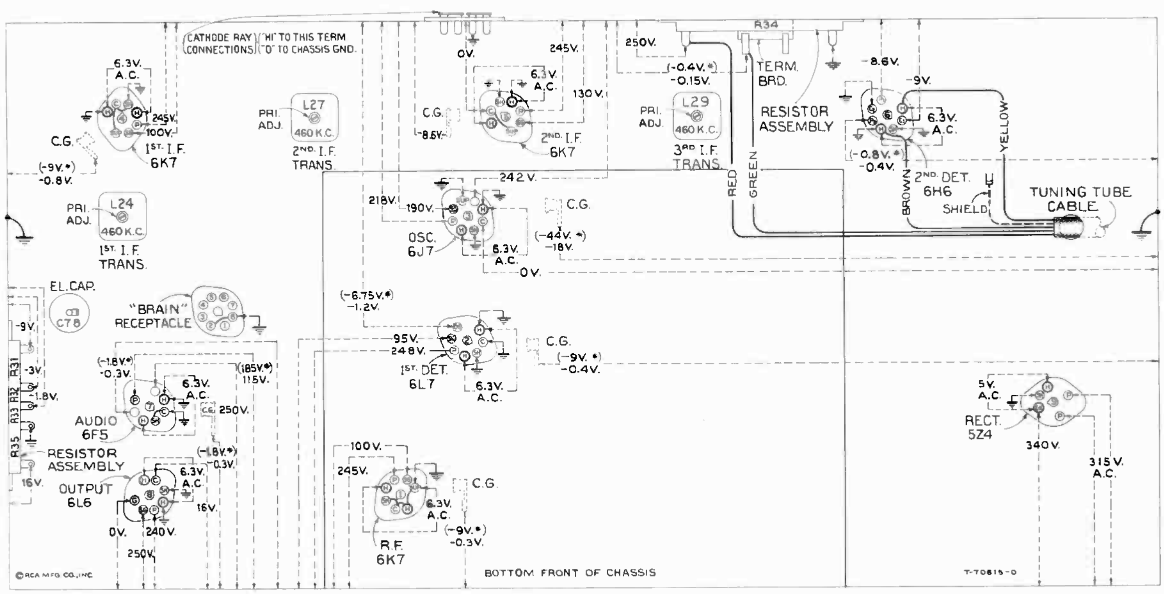


Figure 8—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

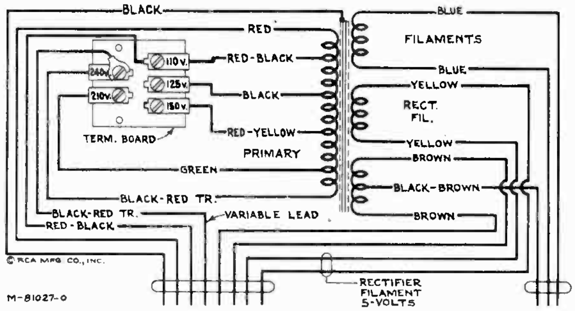
Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Fidelity control counter-clockwise

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parenthesis because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 8 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

Adjust the test oscillator to **20,000 kc.** If the vertical input cathode-ray connections were changed for adjustment (b) above, they should be restored to their original position as shown on figure 3. Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the



Primary resistance—10.1 ohms total
Secondary resistance—266 ohms total

Figure 9—Universal Transformer

signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be round with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The image signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C4** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500–3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37,** and **C5,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc (200–400-kc** range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increased frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph

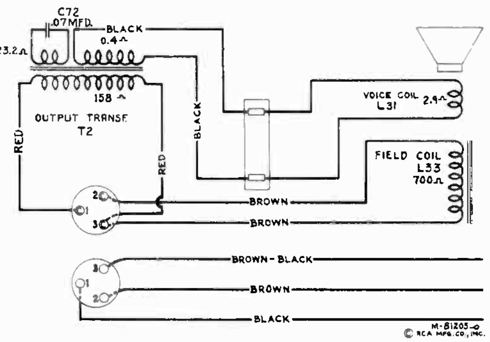


Figure 10—Loudspeaker Wiring

screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the images and best coincident throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves; disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 2).

Selector Dial

Figure 11 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed

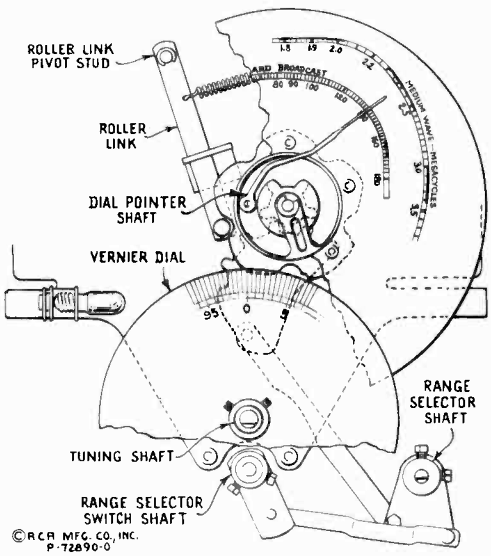


Figure 11—Selector Dial Change Mechanism

in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
12863	Board—Phonograph input terminal board.	$0.25
4427	Bracket—Volume control mounting bracket	.18
12987	Bracket—Band changeover switch bracket.	.15
12985	Cable—Tuning lamp cable and socket...	1.70
12991	Cable—3-conductor shielded fidelity control cable, approximately 7¼ inches long	.50
12511	Cap—Grid contact cap—Package of 5...	.15
12948	Capacitor—33 Mmfd. (C62)	.20
12629	Capacitor—56 Mmfd. (C60)	.20
12404	Capacitor—120 Mmfd. (C56, C57)	.26
12724	Capacitor—120 Mmfd. (C67)	.28
13022	Capacitor—390 Mmfd. (C45, C47, C51, C53)	.25
5148	Capacitor—.007 Mfd. (C69)	.20
4858	Capacitor—.01 Mfd. (C46, C48, C50, C54, C55, C58, C68)	.25
4624	Capacitor—.01 Mfd. (C59)	.54
11315	Capacitor—.015 Mfd. (C71)	.20
4886	Capacitor—.05 Mfd. (C70)	.20
4836	Capacitor—.05 Mfd. (C61)	.30
4841	Capacitor—0.1 Mfd. (C52)	.22
5170	Capacitor—0.25 Mfd. (C49)	.25
4840	Capacitor—0.25 Mfd. (C63)	.30
12741	Capacitor—0.5 Mfd. (C74)	.30
5212	Capacitor—18 Mfd. (C78)	1.16
12872	Capacitor—20 Mfd.—Used in 60-cycle model only (C76)	.90
12467	Capacitor—30 Mfd. (C73, C75)	1.40
12873	Capacitor Pack—Comprising one 20-Mfd. and one 3-Mfd. capacitor, 25-cycle model only (C76, C77)	1.20
12978	Compensator Pack—Comprising one .015-Mfd., one .035-Mfd., and one 0.1-Mfd. capacitor and one 3,900-ohm, one 8,200-ohm and one 27,000-ohm resistor (C64, C65, C66, R23, R24, R26)	1.35
12006	Core—Core and stud assembly for intermediate frequency transformer	.22
12866	Foot—Chassis foot assembly—Package of 2	.75
5226	Lamp—Pilot lamp—Package of 5	.70
12868	Link—Link mechanism on band indicator operating arm	.45
12871	Reactor—Filter reactor (L32)	1.50
12980	Resistor—Voltage divider resistor — Comprising one 250-ohm, one 17-ohm, one 11-ohm and one 38-ohm sections (R31, R32, R33, R35)	.55
12311	Resistor—1,000 ohms—insulated, ¼ watt (R11, R16)—Package of 5	1.00
11935	Resistor—1,000 ohms—carbon type, 1/10 watt (R14)—Package of 5	.75
13097	Resistor—10,000 ohms—insulated, 1 watt (R30)	.22
12876	Resistor—10,000 ohms—wire wound (R10)	.55
12864	Resistor—17,000 ohms—wire wound resistor (R34)	.70
11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R17)—Package of 5	.75
12875	Resistor—56,000 ohms—carbon type, 1 watt (R13)—Package of 5	1.10
11365	Resistor—82,000 ohms—carbon type, ¼ watt (R15)—Package of 5	1.00
8064	Resistor—82,000 ohms—carbon type, ½ watt (R37)—Package of 5	1.00
11281	Resistor—100,000 ohms—carbon type, 1/10 watt (R12)—Package of 5	.75
11398	Resistor—220,000 ohms—carbon type, 1/10 watt (R19)—Package of 5	.75
11323	Resistor—270,000 ohms—carbon type, ¼ watt (R27)—Package of 5	1.00
11172	Resistor—470,000 ohms—carbon type, ¼ watt (R25, R28)—Package of 5	1.00
12013	Resistor—1.0 megohm—carbon type, 1/10 watt—Located in tuning tube socket (R11)—Package of 5	.75
11626	Resistor—2.2 megohm—carbon type, ¼ watt (R18)—Package of 5	1.00
12874	Resistor—3.3 megohm—carbon type, ¼ watt (R20, R21)—Package of 5	1.00
12870	Scale—Vernier dial scale	.65
12008	Shield—Intermediate frequency transformer shield	.28
12607	Shield—1st or 2nd I.F. transformer shield top	.30
12581	Shield—3rd I.F. transformer shield top	.36
11195	Socket—5-contact 5Z4 Radiotron socket.	.15
11198	Socket—7-contact 6K7, 6L6 or 6H6 Radiotron socket	.15
13095	Socket—Upper left or lower right hand dial lamp socket	.25

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
11222	Socket—Upper right or lower left hand dial lamp socket	.18
11381	Socket—Tuning tube socket and cover	.45
11196	Socket—Voltage supply or 6F5 Radiotron socket	.15
12007	Spring—Retaining spring for core in I.F. transformer—Package of 10	.36
12986	Stud—Band indicator operating arm stud—Package of 5	.65
12860	Switch—Low frequency tone and power switch (S4, S6)	1.50
12988	Switch—Bias switch (S7)	.65
12979	Tone Control—High frequency tone and fidelity control (R29, S5)	1.60
12981	Transformer—First intermediate frequency transformer (L24, L25, L26, C45, C47)	2.15
12990	Transformer—Second intermediate frequency transformer (L27, L28, C51, C53)	1.85
12982	Transformer—Third intermediate frequency transformer (L29, L30, C56, C57, C60, R17, R19)	2.25
12856	Transformer—Power transformer, 105-125 volts, 50/60 cycles (T1)	5.35
12857	Transformer—Power transformer, 105-125 volts, 25/60 cycles	7.10
12858	Transformer—Power transformer, 110-125-150-210-240 volts, 40/60 cycles	8.75
12861	Volume Control (R22)	1.00

MAGIC BRAIN UNIT ASSEMBLIES

Stock No.	Description	List Price
12806	Board—3-contact antenna and ground terminal board	.25
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
12886	Cable—Shielded power cable, approximately 4 inches long, complete with 8-contact male plug	1.50
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	.38
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1,500 Mmfd. (C12)	.20
12729	Capacitor—1,550 Mmfd. (C20)	.26
12728	Capacitor—4,500 Mmfd. (C19)	.36
12897	Capacitor—4,700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield, XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil, "D" band (L13, L14)	.60
12880	Coil—Detector coil and shield, XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield, ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield, X band only (L10)	.80
12890	Coil—Oscillator coil, "D" band (L11, L12, L23)	.70
12889	Coil—R.F. coil, "D" band (L21, L22)	.65
12877	Condenser—3-gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8-contact male connector and cover for power cable, Stock No. 12886	.40
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
11324	Resistor—560 ohms—carbon type, 1/4 watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type, 1/4 watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type, 1 watt (R6)	.22
3998	Resistor—15,000 ohms—carbon type, 1/4 watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—carbon type, 1/2 watt (R8)—Package of 5	1.00
11397	Resistor—560,000 ohms—carbon type, 1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stock Nos. 12879, 12880	.22
12710	Shield—Coil shield for Stock No. 12709	.28
12883	Shield—Coil shield for Stock No. 12881	.20
11198	Socket—7-contact 6K7 Radiotron socket	.15
11279	Socket—7-contact 6L7 Radiotron socket	.20
12885	Socket—8-contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core, Stock Nos. 12664, 12800, 12882—Package of 10	.36
12878	Switch—Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave-trap, complete (L1)	.75

DRIVE ASSEMBLIES

Stock No.	Description	List Price
10705	Ball—5/32-inch diameter steel ball for planetary drive—Package of 20	.25
10941	Ball—1/8-inch diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly, complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive, complete, including mounting bracket drive, dial scale and indicator, less vernier dial, Stock No. 12870 and link, Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear, complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly, complete with spring	.30
12911	Screen—Dial lamp screen and light diffuser	.20

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price	Stock No.	Description	List Price
4669	Screw—Set screw for flexible coupling or gear, Stock Nos. 12905 and 12906—Package of 10	.25	9758	Reproducer, complete (Model 10K)	9.40
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75	13289	Transformer—Output transformer (T2)	2.90
12900	Shaft—Vernier drive shaft for planetary drive	.25	11886	Washer—Spring washer to hold field coil securely—Package of 5	.20
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20		MISCELLANEOUS ASSEMBLIES	
12907	Spring—Tension spring for gear, Stock No. 12906—Package of 10	.20	11996	Bracket—Tuning lamp bracket and clamp	.22
8052	Spring—Tension spring for link, Stock No. 8051—Package of 5	.32	12915	Escutcheon—Station selector escutcheon and crystal	1.30
	REPRODUCER ASSEMBLIES		12742	Escutcheon—Tuning lamp escutcheon	.22
12914	Board—Reproducer terminal board	.25	12699	Knob—Large station selector knob—Package of 5	.68
12640	Bracket—Output transformer mounting bracket and clamp	.18	12700	Knob—Small (vernier) station selector knob—Package of 5	.58
12912	Coil—Reproducer field coil (L33)	1.70	11347	Knob—Music-speech and power switch—volume control—range selector or fidelity control knob—Package of 5	.75
13290	Cone—Reproducer cone and dust cap (L31) (Model 10T)	1.35	11377	Screw—Chassis mounting screw assembly—Package of 4 (Model 10T)	.12
13291	Cone—Reproducer cone and dust cap (L31) (Model 10K)	2.55	11210	Screw—Chassis mounting screw assembly—Package of 4 (Model 10K)	.28
5118	Connector—3-contact male connector for speaker leads	.25	12916	Shield—Complete r-f unit top shield	.90
9757	Reproducer, complete (Model 10T)	8.70	4982	Spring—Holding spring for station selector or volume control knob, Stock No. 12699—Package of 10	.50
			11349	Spring—Retaining spring for knob, Stock Nos. 12700 and 11347—Package of 5	.25

The prices quoted above are subject to change without notice.

SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current—in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) Low sensitivity or intermittent operation may be caused by C-43 or C-33 developing low-resistance leakage. Check both capacitors and replace if found defective.

(3) Low sensitivity around 15—16 megacycles may be caused by dirty or poor contact of grounding finger on S-3.

RCA VICTOR MODEL 13K

Thirteen-Tube, Five-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X)	150-410 kc
"Standard Broadcast" (A)	530-1,800 kc
"Medium Wave" (B)	1,800-6,400 kc
"Short Wave" (C)	6,400-23,000 kc
"Ultra Short Wave" (D)	23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X)	175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B)	6,000 kc (osc., det., ant.)
"Short Wave" (C)	20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D)	57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1)	RCA-6K7	R-F Amplifier
(2)	RCA-6L7	First Detector
(3)	RCA-6J7	Oscillator
(4)	RCA-6K7	First I-F Amplifier
(5)	RCA-6K7	Second I-F Amplifier
(6)	RCA-6H6	Second Detector and A.V.C.
(7)	RCA-6C5	Audio Voltage Amplifier
(8)	RCA-6C5	Audio Driver Amplifier
(9)	RCA-6L6	Power Output
(10)	RCA-6L6	Power Output
(11)	RCA-5Z4	Rectifier
(12)	RCA-5Z4	Rectifier
(13)	RCA-6E5	Tuning Tube

Pilot Lamps (4) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycles, 165 watts
Rating B	105-125 volts, 25-60 cycles, 165 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 165 watts

POWER OUTPUT

Undistorted	20 watts
Maximum	30 watts

LOUDSPEAKER

Type	Electrodynamic
Impedance (v.c.)	11¼ ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS

Height	34⅛ inches
Width	48⅞ inches
Depth	18 11/16 inches

WEIGHTS

Net (average)	120 pounds
Shipping (average)	165 pounds

Chassis Base Dimensions .... 20¾ inches x 10½ inches x 3 inches
Over-all Height of Chassis .... 9¼ inches
Operating Controls: (1) Music-speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Fidelity
Tuning Drive Ratios .... 20 to 1 and 100 to 1

General Description

This receiver represents the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model 13K is a thirteen tube, console-type, "Magic Brain" superheterodyne receiver with a twelve-inch electro-dynamic loudspeaker, and the newly developed "Magic Voice." Design features incorporated in this receiver include built-in doublet antenna coupler; "Magic Brain"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; two-stage i-f amplifier; "Magic Eye", push-pull beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; range-selector sensitivity control; fidelity control; "Magic Voice"; three-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof aluminum voice-coil, electrodynamic loudspeaker.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave", "Short wave", and "Ultra short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, two i-f amplifier stages, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, an audio driver-amplifier stage, a push-pull beam-type power-amplifier stage, a tuning indicator "Magic Eye", and a full-wave rectifier.

"Magic Brain"

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7

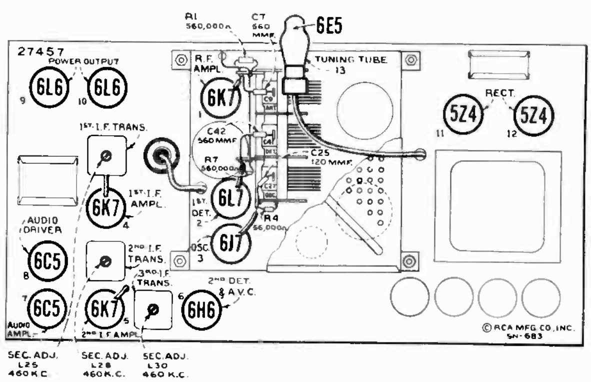


Figure 1—Radiotron and I-F Trimmer Locations

r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a 7/8-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted directly by the range selector. Any inductive effect of L16 is thus eliminated. L19, L18, and L17 are shorted directly by the range selector.

Separate windings, with the exception of L23, are employed in the oscillator stage for each position of the range selector. L23 (inductively coupled to L11 and L12) is placed in the oscillator plate circuit to provide additional feed-back when operating receiver on the "Ultra short wave" (D) band. This coil is effectively r-f bypassed by capacitor C12, when range selector is in the "Short wave" (C) position, to prevent undesirable reactions. Its effect on the remaining bands is negligible. The inherent stability of the oscillator circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to grid No. 3 of the RCA-6L7 first detector.

The output of the "Magic Brain" is fed to the i-f amplifier through a plug-in cable. This cable also supplies all power required by the "Magic Brain" unit.

I-F Amplifier

The intermediate-frequency amplifier consists of two RCA-6K7 tubes in a two-stage, transformer-coupled circuit. The windings of all three i-f transformers are resonated by fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc. A third winding L26, in the first i-f transformer, is placed in series with the main secondary L25 when the fidelity control switch S4 is thrown to "broad" position (see figure 2), thereby increasing the coupling between the primary and secondary circuits with consequent broadening of the band width of the i-f amplifier. The increased band width of the i-f amplifier therefore causes less attenuation of the higher audio modulation side-band frequencies, permitting higher fidelity reception.

Detector and A.V.C.

The modulated signal, as obtained from the output of the last i-f stage, is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R21 and R23, is applied, as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R22, R21, and R23, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the No. 1 diode ceases to draw current and the a.v.c. diode takes over the biasing function. The sensitivity of the receiver is increased in the "Ultra short wave" (D), "Short wave" (C), and "Medium wave" (B) bands by reducing the residual bias on the above mentioned controlled tubes with switch S7 which is operated by the range selector control.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6C5 audio voltage-amplifier tube. This control has a three-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

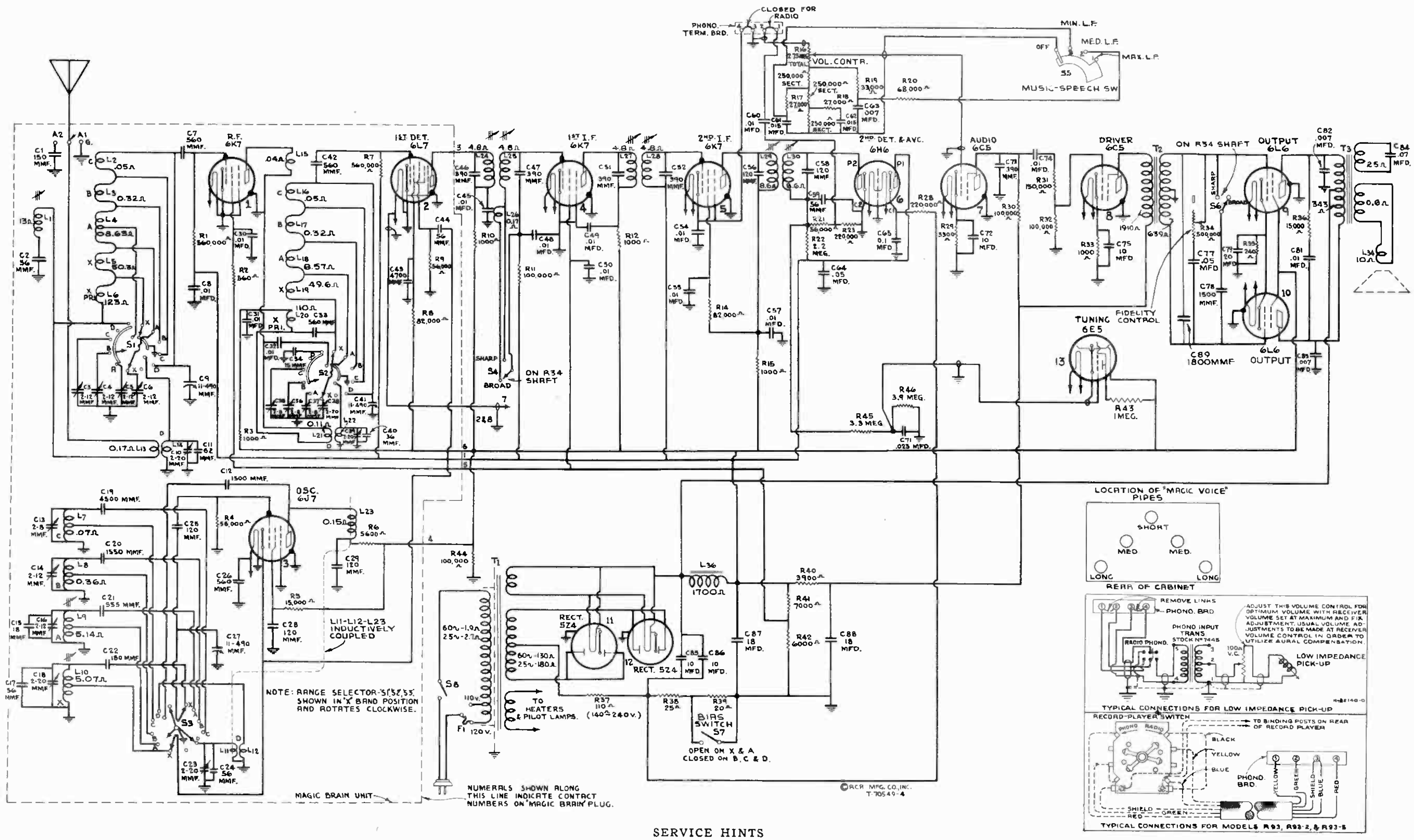
The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6C5 driver tube. The output of this stage is transformer coupled to the control grids of the RCA-6L6 push-pull power output tubes. The output of this stage is transformer coupled to the voice coil of the electrodynamic speaker.

The "Music-speech" control consists of a switch S5 which is connected to two of the tone compensating filters. When this control is turned to its No. 1 (Music) position, maximum low audio-frequency response is obtained. When the control is turned to its No. 2 position, resistor R20 is placed in shunt with capacitor C63, giving greater attenuation of the lower frequencies. This position is a compromise between the "Music" and the "Speech" positions. In the No. 3 (Speech) position, operation is the same as No. 2 position except that capacitor C61 is shorted, giving additional low-frequency attenuation (minimum lows).

Fidelity Control

The fidelity control consists essentially of the combination of a conventional high audio-frequency tone control, including the combinations of capacitor C77 and a variable resistor R34, capacitor C78 and switch S6 in shunt with the secondary winding of transformer T2, and means for changing the band width of the i-f amplifier. It performs in the following manner:

When the fidelity control is in its extreme counterclockwise (sharp) position, the resistance of R34 is minimum, capacitor C78 shunts the secondary of T2, and winding L26 is disconnected from the i-f circuit (S6 and S4 in sharp position, see figure 2). Capacitor C77 is most effective at this point causing maximum attenuation of the higher audio frequencies. As this control is turned clockwise, placing more resistance in series with capacitor C77, the capacitor becomes less and less effective, and the upper frequency range of the audio amplifier is extended. When the fidelity control nears its extreme clockwise position, resistor R34 is disconnected and switches S6 and S4 (operated by fidelity control shaft) respectively disconnect capacitor C78 from the audio circuit and place winding L26 (first i-f transformer) in series with L25 (S6 and S4 in broad posi-



SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current — in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) Low sensitivity or intermittent operation may be caused by C-43 or C-33 developing low-resistance leakage. Check both capacitors and replace if found defective.

(3) Low sensitivity around 15—16 megacycles may be caused by dirty or poor contact of grounding contact finger on S-3.

(4) Motorboating may be due to intermittent capacitor Stock No. 13025.

Figure 2—Schematic Circuit Diagram

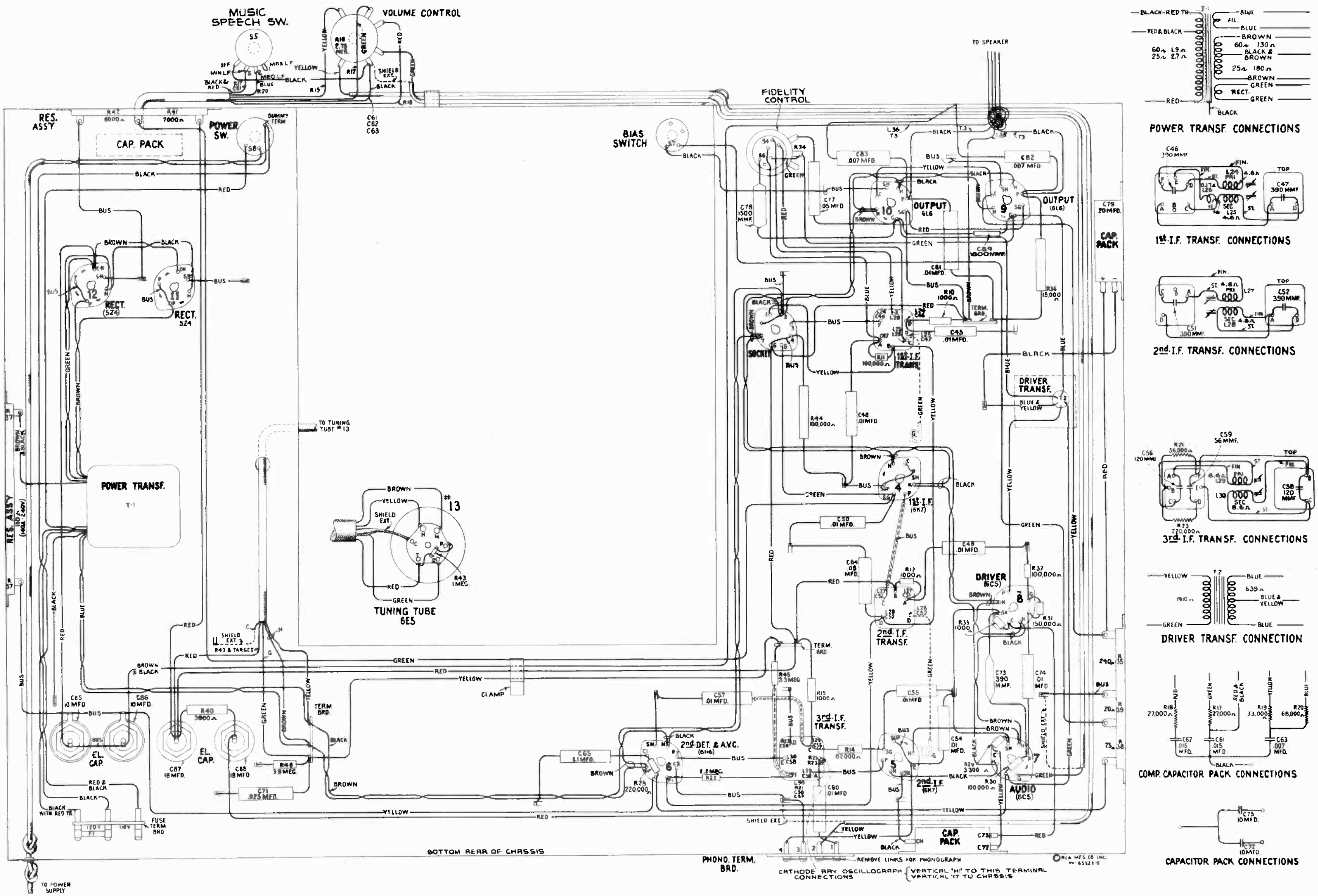


Figure 3—Chassis Wiring Diagram (Less "Magic Brain")

tion) thereby increasing the higher audio-frequency range of the audio amplifier and broadening the i-f amplifier simultaneously.

"Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. A portion of the signal voltage developed across resistors R21 and R23 is used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by minimum width of the dark sector on the fluorescent screen.

"Magic Voice"

This receiver is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker giving extended low-frequency response without boominess, or cabinet resonance. For location of pipes see Schematic Circuit Diagram figure 2.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and six adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining nine adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instrument will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 7. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment

(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead of C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

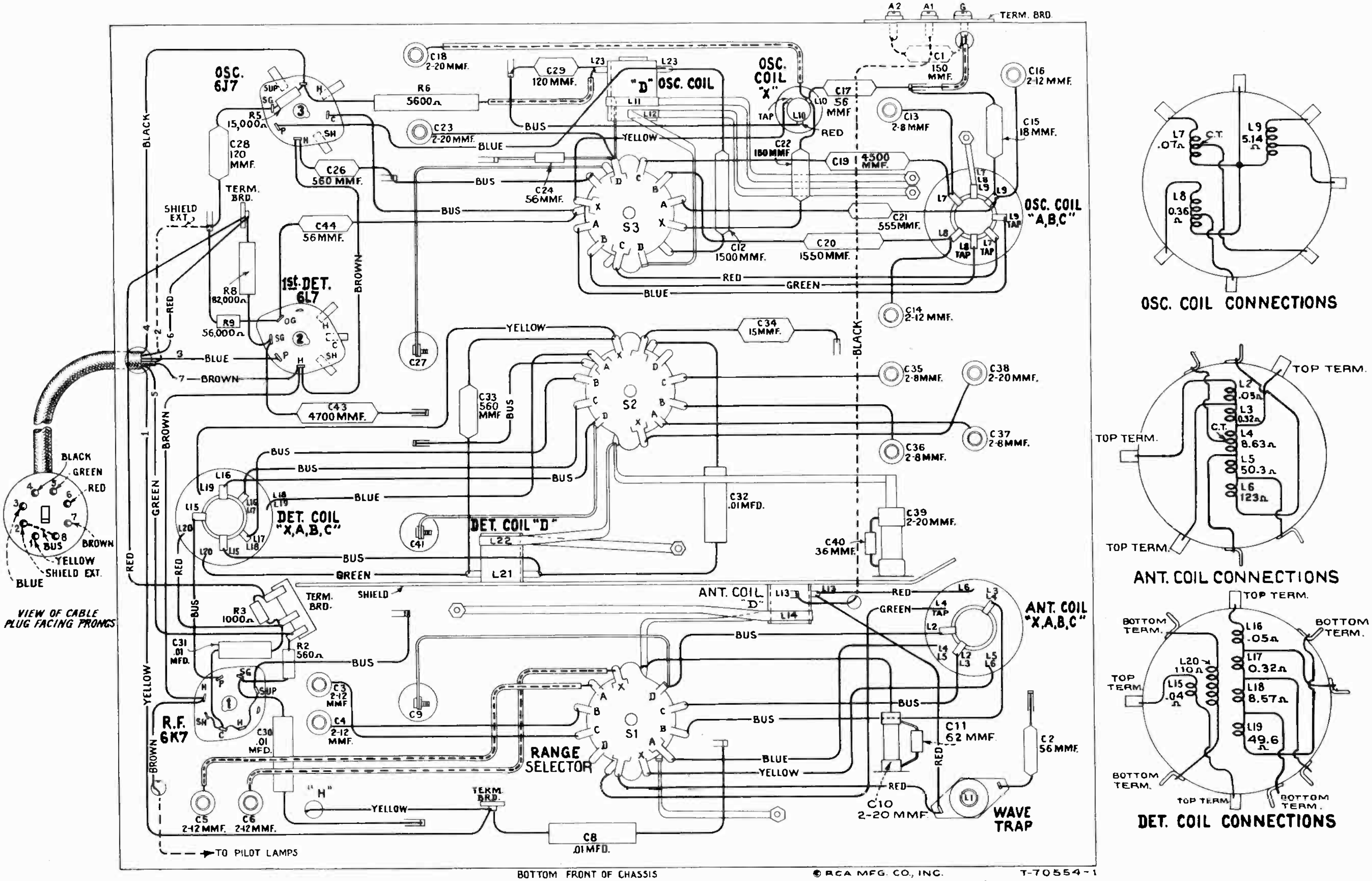


Figure 4—"Magic Brain" Wiring Diagram

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be

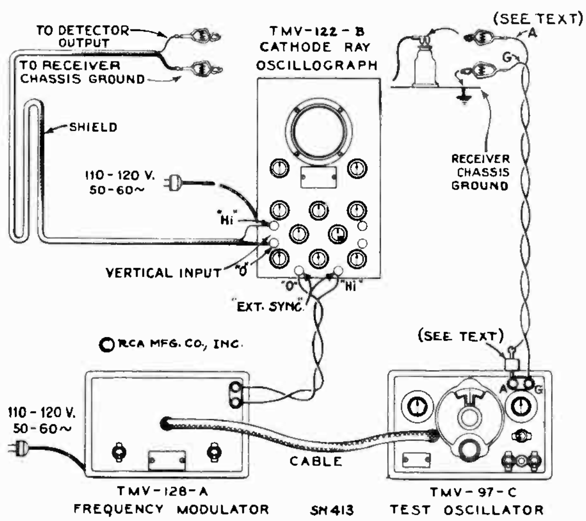


Figure 5—Alignment Apparatus Connections

determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 7. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are **920 kc** apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency **460 kc** below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of this receiver. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response (with the exception of the wave-trap) and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 5. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Turn range selector to its "Standard broadcast" (A) position and tune receiver to a position of no extraneous signals **near 600 kc.** Set fidelity control to counter-clockwise position. Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 second i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L30** and **L29** (see figures 1 and 10) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460 kc** signal.

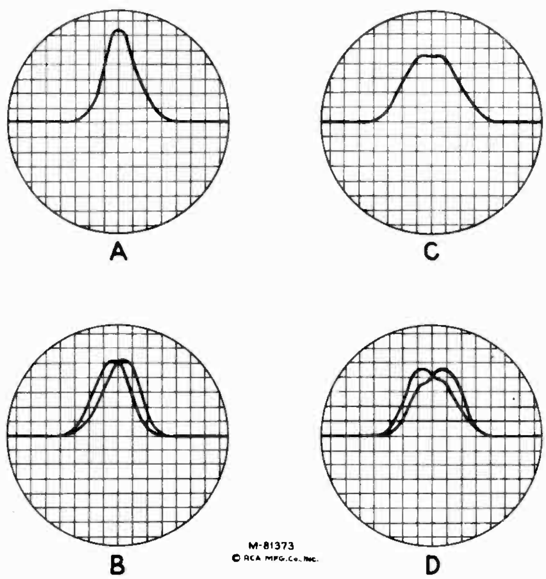


Figure 6—I-F Alignment Oscillograph Curves

A—**Correct** curve showing proper i-f alignment as obtained with fidelity control counter-clockwise.

B—**Incorrect** curve similar to A showing improper alignment of i-f system caused by one or more circuits being slightly detuned.

C—**Correct** showing broadening of curve A obtained when fidelity control is rotated fully clockwise.

D—**Incorrect** curve showing broadening of curve B obtained when fidelity control is rotated fully clockwise.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L30** and **L29** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the RCA-6K7 first i-f tube (with grid lead in place), through a **.001-mfd.** capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two second i-f transformer magnetite core screws **L28** and **L27** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(i) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the RCA-6L7 first-detector, (with grid lead in place) through a **.001-mfd**. capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (h) above.

(j) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to coincide throughout their lengths and have maximum amplitude.

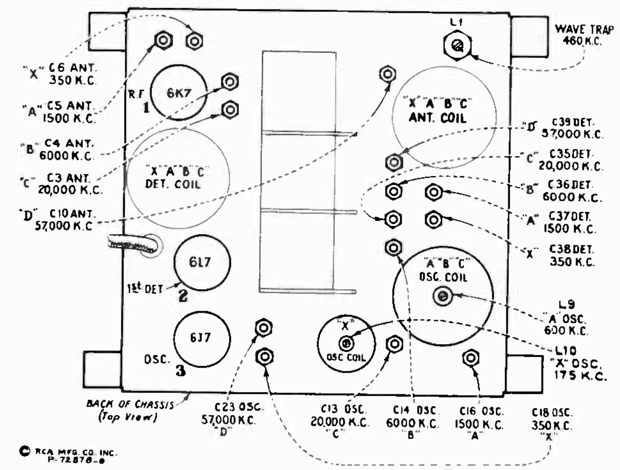
(k) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn receiver fidelity control to extreme clockwise position. Note width of oscillographic image at a point which is 50% of maximum amplitude. Under normal conditions the latter measurement should be approximately 60% greater in width than the former measurement. The image should also appear slightly double humped. These conditions indicate proper broadening of the band width of the i-f amplifier. Turn range selector to "Medium wave" (B) band and note increase of amplitude. The amplitude should increase several times. It may be necessary to decrease output of test oscillator to keep image on screen. Turn receiver fidelity control to extreme counterclockwise position and proceed to "R-F Adjustments."

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 12. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to



APPROX. DISTANCE IN INCHES—CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT.
D	1 1/2	1 7/8	1 5/8
C	1 7/16	1 1/8	1 1/16
B	1 1/8	1 1/8	1 3/8
A	1 1/2	1	1 1/4
X	1 1/2	1 11/16	1 9/16

Figure 7—"Magic Brain" Trimmer Locations

the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment.

Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to the **57,000 kc** input signal (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings (**230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used as this places the test-oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc**) without altering test-oscillator adjustment. Test oscillator second harmonic of **14,-250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater than **28,500 kc,** the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of L11 and L12 (see figure 4) nearer chassis. **Do not allow straps to touch chassis except where connected.** To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test-oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

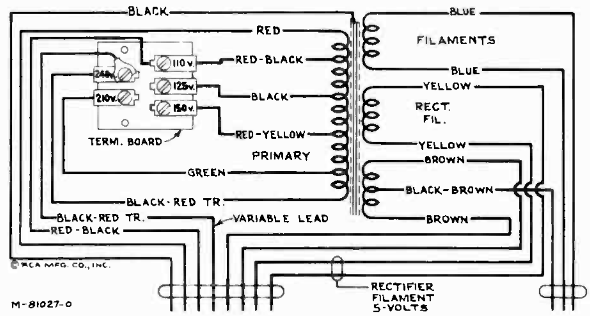
(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The image signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave Band"

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C4** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.



Primary resistance—3.6 ohms total
Secondary resistance—112 ohms total

Figure 8—Universal Transformer

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500–3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37,** and **C5,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust air-trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc (200–400-kc** range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the

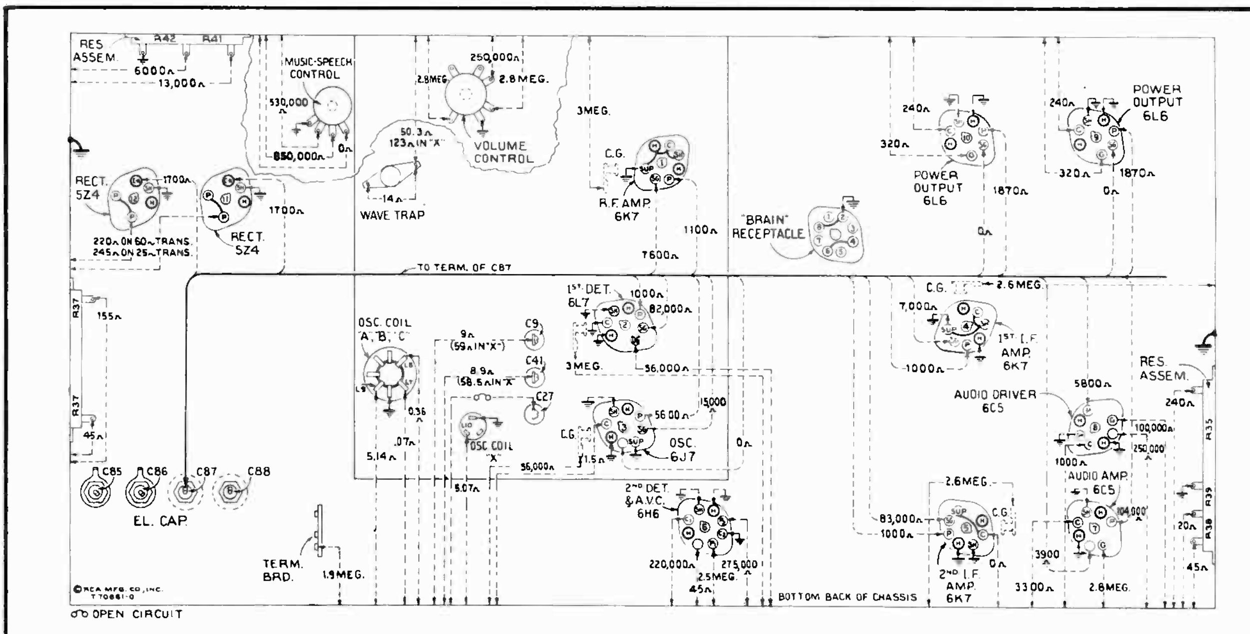


Figure 9—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum—Fidelity control optional—Music-speech Control Clockwise

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 9, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagrams, figures 3 and 4, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm$ 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

images where they best coincide throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F Amp.	6.2 ma.
(2)	RCA-6L7—1st Det.	4.0 ma.
(3)	RCA-6J7—Osc.	6.6 ma.
(4)	RCA-6K7—1st I-F Amp.	6.2 ma.
(5)	RCA-6K7—2nd I-F Amp.	7.5 ma.
(6)	RCA-6H6—2nd Det.—A.V.C.	——
(7)	RCA-6C5—Audio Voltage Amp.	1.25 ma.
(8)	RCA-6C5—Audio Driver Amp.	6.4 ma.
(9)	RCA-6L6—Power Output	43 ma.
(10)	RCA-6L6—Power Output	43 ma.
(11)	RCA-5Z4—Rectifier	80 ma.*
(12)	RCA-5Z4—Rectifier	80 ma.*
(13)	RCA-6E5—Tuning Tube	3.0 ma.

(*Cannot be measured at socket)

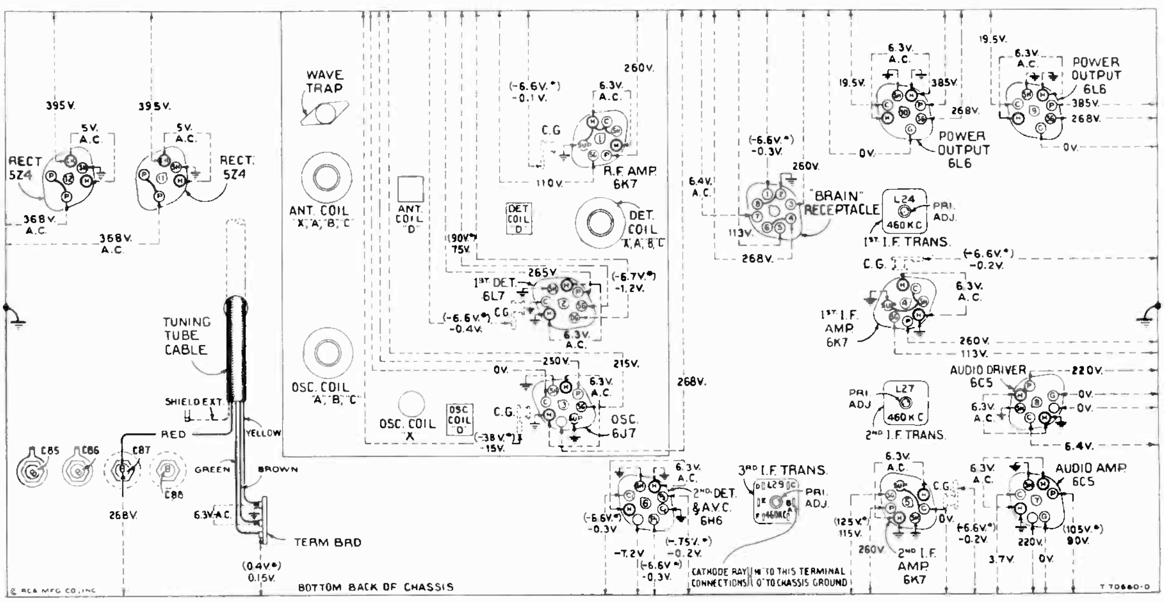


Figure 10—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Fidelity control optional

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 10 will assist in locating cause of faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 2).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This

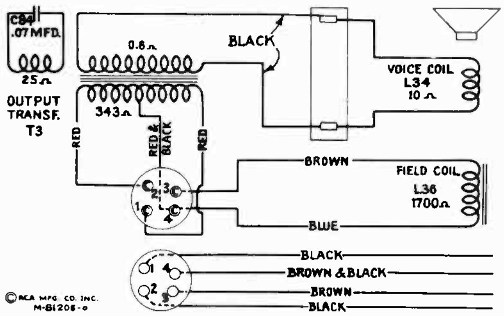


Figure 11—Loudspeaker Wiring

may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Selector Dial

Figure 12 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

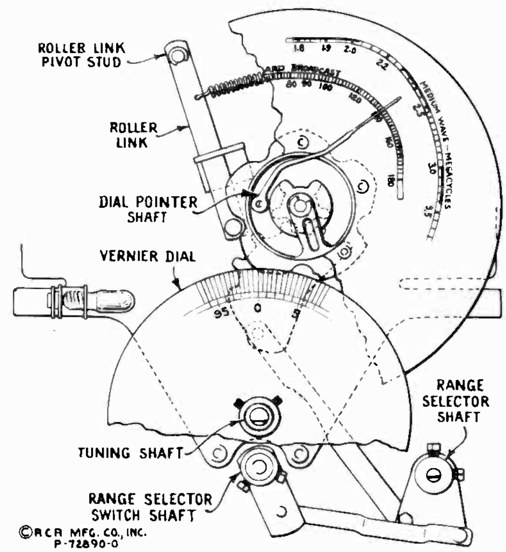


Figure 12—Selector Dial Change Mechanism

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES		4427	Bracket—Volume control and L. F. tone control mounting bracket	$0.18
12863	Board—Phonograph terminal board	$0.25	13024	Cable—Tuning lamp cable and socket	1.25
12987	Bracket—Mounting bracket for bias switch	.15	12511	Cap—Grid contact cap—Package of 5	.15

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
12629	Capacitor—56 Mmfd. (C59)	$0.20	12013	Resistor—1 meg—Carbon type—1/10 watt—Package of 5 (R43)	$0.75
12404	Capacitor—120 Mmfd. (C56, C58)	.26	12679	Resistor—2.2 meg—Insulated—¼ watt—Package of 5 (R22)	1.00
13034	Capacitor—390 Mmfd. (C73)	.25	12874	Resistor—3.3 meg—Carbon type—¼ watt—Package of 5 (R45)	1.00
13301	Capacitor—390 Mmfd. (C46, C47, C51, C52)	.25	13167	Resistor—3.9 meg—Carbon type—¼ watt—Package of 5 (R46)	1.00
12898	Capacitor—1,500 Mmfd. (C78)	.20	13017	Resistor—Voltage divider comprisiug one 7,000-ohm and one 6,000-ohm sections (R41, R42)	.90
13580	Capacitor—1,800 Mmfd. (C89)	.25	13018	Resistor—Voltage divider comprising one 240-ohm, one 20-ohm and one 25-ohm sections (R35, R38, R39)	.55
13033	Capacitor—.007 Mfd. (C82, C83)	.20	4669	Screw—No. 8-32 x 5/32 set screw for link assembly—Stock No. 12868—Package of 10	.25
4870	Capacitor—.025 Mfd. (C71)	.20	12008	Shield—I. F. transformer shield for Stock Nos. 12981, 12990, 12982	.28
4858	Capacitor—.01 Mfd. (C45, C48, C49, C50, C54, C55, C57, C60, C74)	.25	12607	Shield—Transformer shield top for first or second I. F. transformer	.30
4937	Capacitor—.01 Mfd. (C81)	.25	12581	Shield—Transformer shield top for third I. F. transformer	.36
4836	Capacitor—.05 Mfd. (C64, C77)	.30	11195	Socket—5-contact 5Z4 Radiotron socket	.15
4841	Capacitor—0.1 Mfd. (C65)	.22	11198	Socket—7-contact 6K7 or 6L6 Radiotron socket	.15
11203	Capacitor—10 Mfd. (C85, C86)	1.18	11196	Socket—8-contact 6C5 or 6H6 Radiotron and Magic Brain power supply socket	.15
5212	Capacitor—18 Mfd. (C87, C88)	1.16	11381	Socket—Tuning lamp socket and cover	.45
12470	Capacitor—20 Mfd. (C79)	1.10	13095	Socket—Upper left or lower right hand dial lamp socket	.25
13011	Capacitor—Compensating pack comprising two .015 Mfd., one .007 Mfd. capacitors and two 27,000-ohm, one 33,000-ohm, and one 68,000-ohm resistors (C61, C62, C63, R17, R18, R19, R20)	2.00	11222	Socket—Upper right or lower left hand dial lamp socket	.18
13025	Capacitor—Pack comprising two 10 Mfd. sections (C72, C75)	1.00	12007	Spring—Retaining spring for core, Stock No. 12006—Package of 10	.36
5040	Connector—4-contact female connector for speaker cable	.25	12986	Stud—Stud, nut and washer for connecting link assembly, Stock No. 12868, to sector gear and link, Stock No. 12910—Package of 5	.65
12006	Core—Adjustable core and stud for Stk. Nos. 12981, 12990, 12982	.22	12988	Switch—Bias switch (S7)	.65
5240	Cover—Fuse mounting cover	.24	13015	Tone control—Fidelity control (R34, S4, S6)	1.00
12870	Dial—Vernier dial scale	.65	13013	Tone control—Music-speech and power switch (S5, S8)	1.15
10907	Fuse—3 Amp.—Package of 5—(F1)	.40	12981	Transformer—First I. F. transformer complete (L24, L25, L26, C46, C47)	2.15
5226	Lamp—Dial lamp—6.3 volts—Package of 5	.70	12990	Transformer—Second I. F. transformer complete (L27, L28, C51, C52)	1.85
12868	Link—Range switch and band indicator operating link complete with set screws	.45	12982	Transformer—Third I. F. transformer complete (L29, L30, C56, C58, C59, R21, R23)	2.25
13012	Mounting—Fuse mounting, 100-120-volt models only	.35	13023	Transformer—Driver transformer (T2)	2.25
13026	Mounting—Fuse mounting, 220-volt models only	.35	13008	Transformer—Power transformer, 100-120 volts, 50-60 cycles (T1)	7.55
13027	Resistor—110 ohms, wire wound—used in 110-volt models only (R37)	.50	13009	Transformer—Power transformer, 100-120 volts, 25-50 cycles (T1)	11.20
13029	Resistor—140 ohms, wire wound—used in 220-volt models only (R37)	.75	13010	Transformer—Power transformer, 100-250 volts, 50-60 cycles (T1)	12.65
13030	Resistor—1,000 ohms—Carbon type—1/10 watt—Package of 5 (R12)	.75	13014	Volume control—(R16)	1.00
5112	Resistor—1,000 ohms—Carbon type—¼ watt—Package of 5 (R10, R15)	1.00		**MAGIC BRAIN UNIT ASSEMBLIES**	
13031	Resistor—3,300 ohms—Carbon type—1/10 watt—Package of 5 (R29)	.75	12806	Board—3-contact antenna and ground terminal board	.25
13032	Resistor—3,900 ohms—Carbon type—1 watt—Package of 5 (R40)	1.10	5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
5114	Resistor—15,000 ohms—Carbon type—1 watt (R36)	.22	12886	Cable—Shielded power cable, approx. 4 inches long, complete with 8-contact male plug	1.50
11282	Resistor—56,000 ohms—Carbon type—1/10 watt—Package of 5 (R21)	.75	12511	Cap—Grid contact cap—Package of 5	.15
11365	Resistor—82,000 ohms—Carbon type—¼ watt—Package of 5 (R14)	1.00			
11281	Resistor—100,000 ohms—Carbon type—1/10 watt—Package of 5 (R11)	.75			
12263	Resistor—100,000 ohms — Insulated—¼ watt—Package of 5 (R30)	1.00			
3058	Resistor—100,000 ohms—Carbon type—1 watt—Package of 5 (R44)	1.10			
12478	Resistor—150,000 ohms—Carbon type—1/10 watt—Package of 5 (R31)	.75			
12264	Resistor—220,000 ohms—Insulated — ¼ watt—Package of 5 (R28)	1.00			
11398	Resistor—220,000 ohms—Carbon type—1/10 watt—Package of 5 (R23)	.75			

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	$0.38
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1500 Mmfd. (C12)	.20
12729	Capacitor—1550 Mmfd. (C20)	.26
12728	Capacitor—4500 Mmfd. (C19)	.36
12897	Capacitor—4700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil "D" band (L13, L14	.60
12880	Coil—Detector coil and shield XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield X band only (L10)	.80
12890	Coil—Oscillator coil "D" band (L11, L12, L23)	.70
12889	Coil—R. F. Coil "D" band (L21, L22)	.65
12877	Condenser—3 gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8 contact male connector and cover for power cable Stk. No. 12886	.40
12664	Core—Adjustable core and stud for Stk. No. 12654	.22
12800	Core—Adjustable core and stud for Stk. 12709	.20
12882	Core—Adjustable core and stud for Stk. No. 12881	.20
11324	Resistor—560 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—Carbon type—1 watt (R6)	.22
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—Carbon type—1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
11397	Resistor—560,000 ohms—Carbon type—1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stk. Nos. 12879 and 12880	.22
12710	Shield—Coil shield for Stk. No. 12709	.28
12883	Shield—Coil shield for Stk. No. 12881	.20
11198	Socket—7 contact 6K7 Radiotron socket	.15
11279	Socket—7 contact 6L7 Radiotron socket	.20
12885	Socket—8 contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core Stk. Nos. 12664, 12800 and 12882—Package of 10	.36
12878	Switch—Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave trap complete (L1)	.75

Stock No.	DESCRIPTION	List Price
	DRIVE ASSEMBLIES	
10705	Ball—5/32 in. diameter steel ball for planetary drive—Package of 20	$0.25
10941	Ball—1/8 in. diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive complete including mounting bracket, drive, dial scale, and indicator less vernier dial Stk. No. 12870 and link Stk. No. 12868	4.40
12906	Gear—Anti-lash drive gear complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly complete with springs	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear stock Nos. 12905 and 12906—Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link stock No. 8051—Package of 5	.32
	REPRODUCER ASSEMBLIES	
8059	Board—Reproducer terminal board	.14
12640	Bracket—Output transformer mounting bracket	.18
12474	Cone—Reproducer cone and dust cap (L34)	6.80
11577	Coil—Field coil, magnet and cone support (L36)	12.00
5039	Connector—4 contact male connector for reproducer leads	.25
9719	Reproducer Complete	20.40
13007	Transformer—Output transformer (T3, C84)	3.80
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket and clamp	.22
12915	Crystal—Station selector escutcheon and crystal	1.30
12742	Escutcheon—Tuning tube escutcheon	.22
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11347	Knob—Volume control, Fidelity control, music-speech and power switch, and range selector knob—Package of 5	.75
11210	Screw—Chassis mounting screw and washer assembly—Package of 4	.28
12916	Shield—Magic brain shield	.90
4982	Spring—Retaining spring for knob stock No. 12699—Package of 10	.50
11349	Spring—Retaining spring for knob stock Nos. 11347, 12700—Package of 5	.25

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 15K

Fifteen-Tube, Five-Band, A-C, Superheterodyne Receiver

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X)	150-410 kc
"Standard Broadcast" (A)	530-1,800 kc
"Medium Wave" (B)	1,800-6,400 kc
"Short Wave" (C)	6,400-23,000 kc
"Ultra Short Wave" (D)	23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X)	175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B)	6,000 kc (osc., det., ant.)
"Short Wave" (C)	20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D)	57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1)	RCA-6K7	R-F Amplifier
(2)	RCA-6L7	First Detector
(3)	RCA-6J7	Oscillator
(4)	RCA-6K7	First I-F Amplifier
(5)	RCA-6K7	Second I-F Amplifier
(6)	RCA-6H6	Second Detector and A.V.C.
(7)	RCA-6K7	Tuning Tube I-F Amplifier
(8)	RCA-6H6	Tuning Tube Rectifier
(9)	RCA-6C5	Audio Voltage Amplifier
(10)	RCA-6C5	Audio Driver Amplifier
(11)	RCA-6L6	Power Output
(12)	RCA-6L6	Power Output
(13)	RCA-5Z4	Rectifier
(14)	RCA-5Z4	Rectifier
(15)	RCA-6E5	Tuning Tube

Pilot Lamps (4) .... Mazda No. 46, 6.3 volts, 0.25 ampere

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycles, 165 watts
Rating B	105-125 volts, 25-60 cycles, 165 watts
Rating C	100-130/140-160/195-250 volts, 40-60 cycles, 165 watts

POWER OUTPUT

Undistorted	20 watts
Maximum	30 watts

LOUDSPEAKER

Type	Electrodynamic
Impedance (v.c.)	11¼ ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS

Height	41½ inches
Width	28⅛ inches
Depth	16⅜ inches

WEIGHTS

Net	115 pounds
Shipping	161 pounds

Chassis Base Dimensions .... 20¾ inches x 10½ inches x 3 inches
Over-all Height of Chassis .... 9¼ inches
Operating Controls: (1) Music-speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector, (5) Fidelity
Tuning Drive Ratios .... 20 to 1 and 100 to 1

General Description

This receiver represents the result of thorough development, design, and substantial manufacture. Noteworthy technical improvements have been applied in achieving marked advantages of operation, and efficiency of performance.

Model 15K is a fifteen-tube, console-type, "Magic Brain" superheterodyne receiver with a twelve-inch electro-dynamic loudspeaker, and the newly developed "Magic Voice." Design features incorporated in this receiver include built-in doublet antenna coupler; "Magic Brain"; improved plunger-type air-dielectric adjustable trimming capacitors in the antenna, detector, and oscillator coil circuits; tuned r-f amplifier; high-efficiency first detector (converter) with separate oscillator; two-stage i-f amplifier; selective "Magic Eye"; push-pull beam-type power amplifier; magnetite core adjusted i-f transformers, low-frequency oscillator tracking, and wave-trap; range-selector sensitivity control; fidelity control; "Magic Voice"; three-point aural compensated volume control; music-speech switch; automatic volume control; phonograph terminal board; new selector dial; and a dust-proof aluminum voice-coil, electrodynamic loudspeaker.

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized, with all important connections being readily accessible. Trimming adjustments are located at accessible points. A double tuning-knob arrangement permits the choice of either a twenty-to-one or a hundred-to-one dial drive ratio. The latter permits ease of tuning, especially in the "Medium wave", "Short wave", and "Ultra short wave" bands.

Circuit Arrangement

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, two signal i-f amplifier stages, tuning tube i-f amplifier and rectifier stages, a diode-detector—automatic-volume-control stage, an audio voltage-amplifier stage, an audio driver-amplifier stage, a push-pull beam-type power-amplifier stage, a tuning indicator "Magic Eye", and a full-wave rectifier.

"Magic Brain"

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

A single-wire antenna, or a doublet antenna, when connected to the proper input terminals of the receiver, is coupled to the control grid of the RCA-6K7

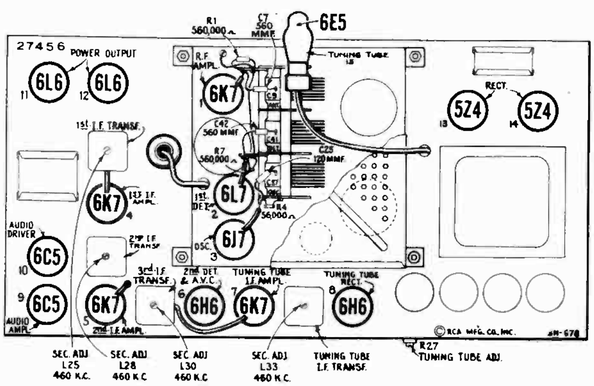


Figure 1—Radiotron and I-F Trimmer Locations

r-f amplifier tube through the tuned r-f transformer consisting of L6, L5, L4, L3, and L2 (except when range selector is in "Ultra short wave" position). The primary coil L13 of the "Ultra short wave" (D) band tuned r-f transformer remains in the antenna circuit at all times. A unique method of switching is used. In the "Long wave" (X) band, L6 becomes the primary with L5, L4, L3, and L2 as secondary. In the "Standard broadcast" (A) band, L5 becomes the primary with L4, L3, and L2 as secondary (L6 shorted out). In the "Medium wave" (B) band, L4 becomes the primary with L3 and L2 as secondary (L6 and L5 shorted out). In the "Short wave" (C) band, L3 becomes the primary with L2 as secondary (L6, L5, L4, and tap on L4 shorted out). The tap on L4 is provided to prevent interaction with L3 and L2 when operating receiver in "Short wave" band. In the "Ultra short wave" (D) band, L6, L5, L4, and L3 are shorted out and grounded, and secondary L14 is placed in shunt with L2. The latter connection prevents undesirable interaction of L2 with L14. This method of switching reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation.

The band switching of the detector circuits is similar to that of the antenna circuits. Coils L15, L21, and L20 are always connected in series with the plate circuit of the RCA-6K7 r-f amplifier tube. In the "Long wave" (X) band, L19, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is at the low end of L19. L20 acts as the primary which transfers energy to the secondary L19. Capacitor C33 resonates primary L20 at the proper frequency. In the "Standard broadcast" (A) band, L18, L17, and L16 are connected in series as the secondary circuit. The ground of the coil system is now between L18 and L19. L19 is used as the primary and is resonated at the proper frequency by capacitors C34 and C35 which are in shunt with this coil. Capacitor C33 is connected to transfer energy to the primary coil L19. In the "Medium wave" (B) band, L17 and L16 are connected in series as the secondary. The ground of the coil system is now between L17 and L18. L18 is used as the primary and is resonated at the proper frequency by capacitor C34 which is in shunt with this coil. L19 is shorted by the range selector. Capacitor C33 transfers the r-f energy from the plate circuit to the primary L18. In the "Short wave" (C) band, L16 is the secondary. The ground of the coil system is now between L16 and L17. L17 is used as the primary and is resonated to the proper frequency by capacitor C34. In addition, L15 acts as a high-frequency primary which resonates above 20 mc and improves the gain at the high-frequency end of the "Short wave" band. Coils L19 and L18 are shorted by the range selector. L21 is effectively r-f bypassed in this position by capacitor C32. In the "Ultra short wave" (D) band, L22 is the secondary, or grid coil, and consists of approximately a single turn of silver plated strap around a ⅞-inch coil form. The primary coils, L21 and L15 are in series on this band, with L21 acting as a low-frequency primary and L15 as a high-frequency primary. L16 is shunted by L22 instead of being shorted directly by the range selector. Any inductive effect of L16 is thus eliminated. L19, L18, and L17 are shorted directly by the range selector.

Separate windings, with the exception of L23, are employed in the oscillator stage for each position of the range selector. L23 (inductively coupled to L11 and L12) is placed in the oscillator plate circuit to provide additional feed-back when operating receiver on the "Ultra short wave" (D) band. This coil is effectively r-f bypassed by capacitor C12, when range selector is in the "Short wave" (C) position, to prevent undesirable reactions. Its effect on the remaining bands is negligible. The inherent stability of the oscillator circuit provides minimum frequency drift which is especially advantageous for high-frequency reception. The locally generated signal is capacitance coupled to grid No. 3 of the RCA-6L7 first detector.

The output of the "Magic Brain" is fed to the i-f amplifier through a plug-in cable. This cable also supplies all power required by the "Magic Brain" unit.

I-F Amplifier (Signal)

The intermediate-frequency amplifier consists of two RCA-6K7 tubes in a two-stage, transformer-coupled circuit. The windings of all three i-f transformers are resonated by fixed capacitors, and are adjusted by molded magnetite cores (both primary and secondary) to tune to 460 kc. A third winding L26, in the first i-f transformer, is placed in series with the main secondary L25 when the fidelity control switch S4 is thrown to "broad" position (see figure 2), thereby increasing the coupling between the primary and secondary circuits with consequent broadening of the band width of the i-f amplifier. The increased band width of the i-f amplifier therefore causes less attenuation of the higher audio modulation side-band frequencies, permitting higher fidelity reception. A third winding L31 in the third i-f transformer supplies signal input to the tuning tube i-f amplifier.

Tuning Tube I-F Amplifier

The i-f signal voltage developed in L31 (third i-f transformer) is applied to the control grid of the RCA-6K7 tuning tube i-f amplifier. The output of this tube is coupled through a sharply tuned transformer to the RCA-6H6 tuning tube rectifier. All or a portion of the voltage which develops across resistor R27 (adjustable from back of chassis, see figure 1) is transferred from the movable arm to the grid of the RCA-6E5 cathode-ray tuning tube through a suitable resistance-capacitance filter. The sharpness of this amplifier permits the receiver to be accurately tuned to the incoming carrier with the tuning tube "Magic Eye" while operating receiver with the fidelity control in extreme clockwise (broad) position.

Detector and A.V.C.

The modulated signal, as obtained from the output of the last i-f stage, is detected by an RCA-6H6 twin-diode tube (No. 2 diode). The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistors R21 and R23, is applied, as automatic control-grid bias to the r-f, first-detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R22, R21, and R23, thereby maintaining the desired operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The sensitivity of the receiver is increased in the "Ultra short wave" (D), "Short wave" (C), and "Medium wave" (B) bands by reducing the residual bias on the above mentioned controlled tubes with switch S7 which is operated by the range selector control.

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector-diode and the input grid of the RCA-6C5 audio voltage-amplifier tube. This control has a three-point tone-compensating filter connected to it so that the correct aural balance will be obtained at different volume settings. Phonograph terminals are provided to feed the output of an external phonograph pickup to the control grid of the audio amplifier through this aurally compensated volume control.

The output of the voltage amplifier is resistance-capacitance coupled to the control grid of the RCA-6C5 driver tube. The output of this stage is transformer coupled to the control grids of the RCA-6L6 push-pull power output tubes. The output of this stage is transformer coupled to the voice coil of the electro-dynamic speaker.

The "Music-speech" control consists of a switch S5 which is connected to two of the tone compensating filters. When this control is turned to its No. 1 (Music) position, maximum low audio-frequency response is obtained. When the control is turned to its No. 2 position, resistor R20 is placed in shunt with capacitor C63, giving greater attenuation of the lower frequencies. This position is a compromise between the "Music" and the "Speech" positions. In the No. 3 (Speech) position, operation is the same as No. 2 position except that capacitor C61 is shorted, giving additional low-frequency attenuation (minimum lows).

Fidelity Control

The fidelity control consists essentially of the combination of a conventional high audio-frequency tone control, including the combinations of capacitor C77 and a variable resistor R34, capacitor C78 and switch S6 in shunt with the secondary winding of transformer T2, and means for changing the band width of the i-f amplifier. It performs in the following manner:

When the fidelity control is in its extreme counterclockwise (sharp) position, the resistance of R34 is

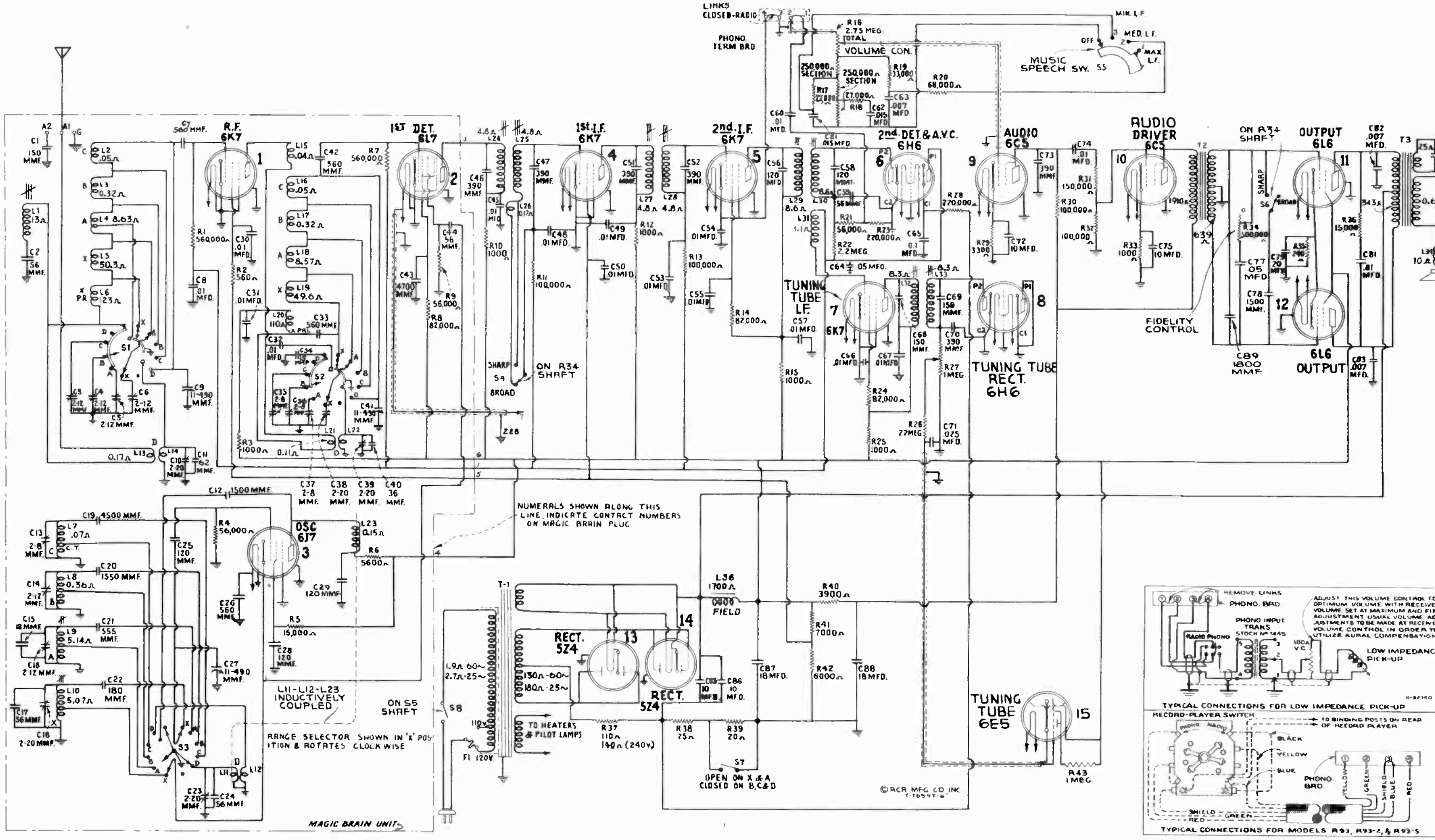


Figure 2—Schematic Circuit Diagram

SERVICE HINTS

(1) Excessive heating of the 6E5 tube may be due to high cathode current — in excess of 7 ma. The tube should be replaced and the condition of the 5Z4 rectifier checked.

(2) Low sensitivity or intermittent operation may be caused by C-43 or C-33 developing low-resistance leakage. Check both capacitors and replace if found defective.

(3) Low sensitivity around 15—16 megacycles may be caused by dirty or poor contact of grounding contact finger on S-3.

(4) Motorboating may be due to intermittent capacitor Stock No. 13025.

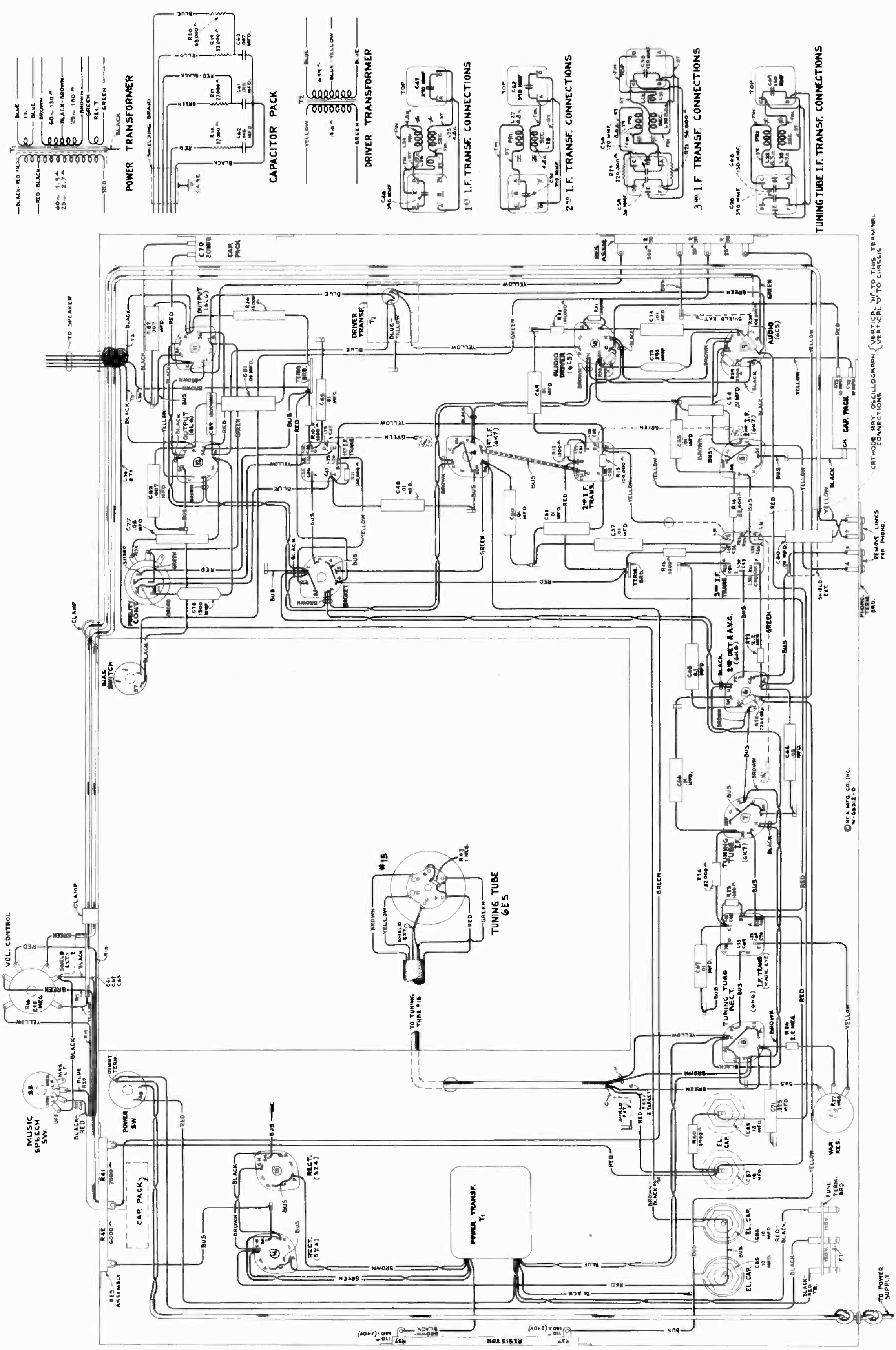


Figure 3—Chassis Wiring Diagram (Less "Magic Brain")

minimum, capacitor C78 shunts the secondary of T2, and winding L26 is disconnected from the i-f circuit (S6 and S4 in sharp position, see figure 2). Capacitor C77 is most effective at this point causing maximum attenuation of the higher audio frequencies. As this control is turned clockwise, placing more resistance in series with capacitor C77, the capacitor becomes less and less effective, and the upper frequency range of the audio amplifier is extended. When the fidelity control nears its extreme clockwise position, resistor R34 is disconnected and switches S6 and S4 (operated by fidelity control shaft) respectively disconnect capacitor C78 from the audio circuit and place winding L26 (first i-f transformer) in series with L25 (S6 and S4 in broad position) thereby increasing the higher audio-frequency range of the audio amplifier and broadening the i-f amplifier simultaneously.

Selective "Magic Eye"

An RCA-6E5 cathode-ray tuning tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube consists of an amplifier section and a cathode-ray section built in the same glass envelope. The adjustable arm of R27 selects the voltage used to actuate the grid of the amplifier section. Maximum voltage is applied to this grid when the receiver is tuned to resonance with an incoming carrier. This condition is evidenced by minimum width of the dark sector on the fluorescent screen.

"Magic Voice"

This receiver is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and eight adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining eleven adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied in the sequence given, normal performance of the instrument will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 7. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment

(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead of C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

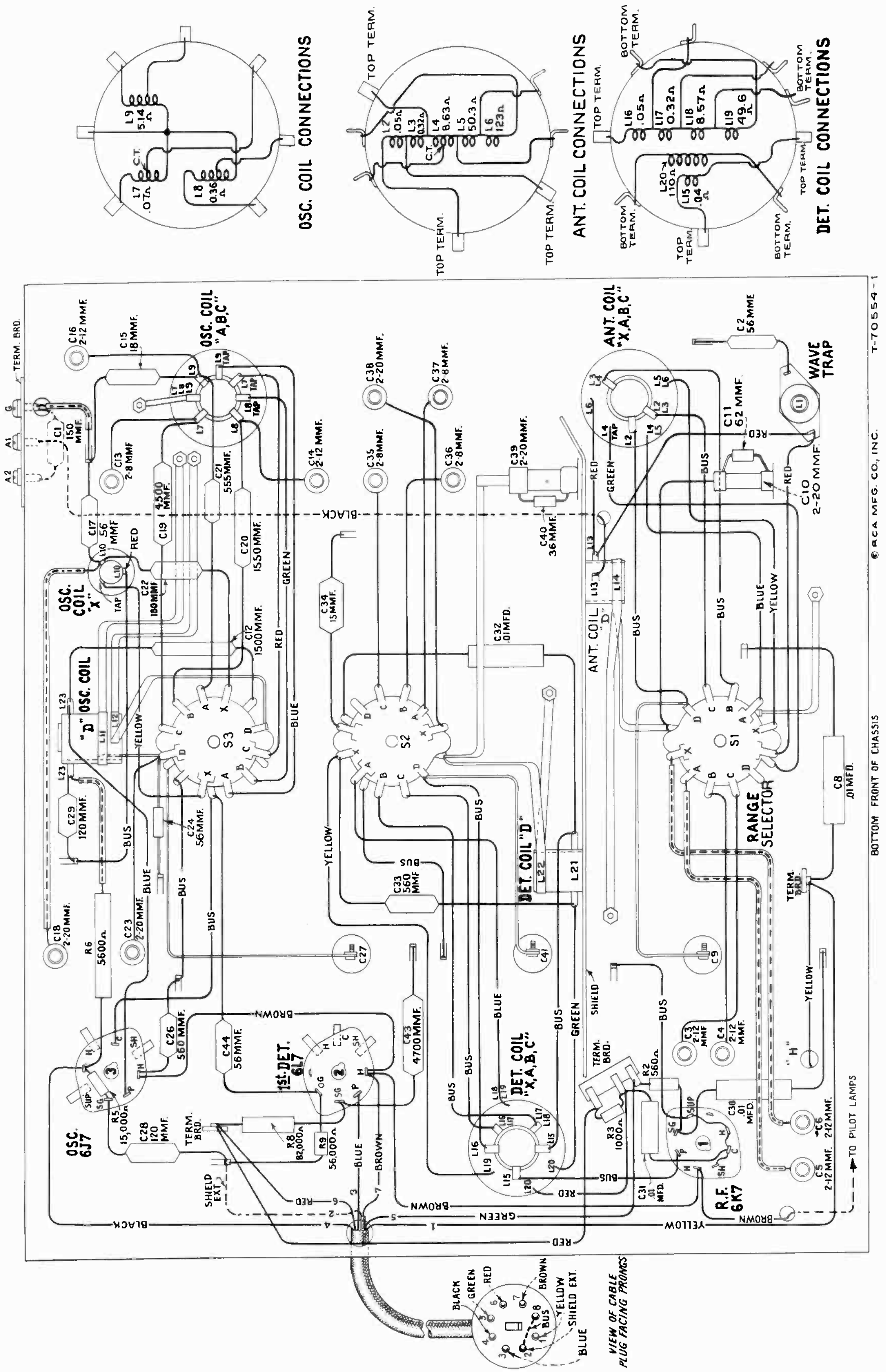


Figure 4—"Magic Brain" Wiring Diagram

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set

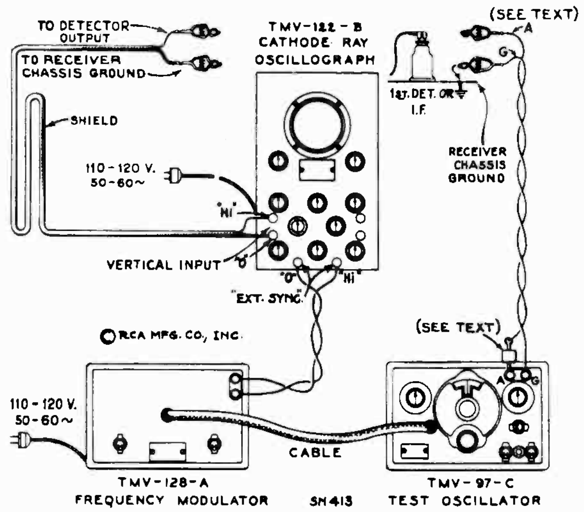


Figure 5—Alignment Apparatus Connections

to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 7. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are **920 kc** apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency **460 kc** below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of this receiver. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response (with the exception of the wave-trap) and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 5. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 3. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Turn range selector to its "Standard broadcast" (A) position and tune receiver to a position of no extraneous signals **near 600 kc.** Set fidelity control to counter-clockwise position. Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 second i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L30** and **L29** (see figures 1 and 10) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460 kc** signal.

(d) Turn tuning tube adjustment screw **R27** (see figure 1) to extreme clockwise position. Adjust output of test oscillator until the width of the dark sector on the fluorescent screen in the RCA-6E5 tuning tube is very narrow ("Magic Eye" almost closed). Adjust the two magnetite core screws **L33** and **L32** (one on top and one on bottom, see figures 1 and 10) of the tuning tube i-f transformer until minimum width of the dark sector on the fluorescent screen is observed. A decrease of the test-oscillator output may be necessary before the point of minimum width of the dark sector becomes apparent.

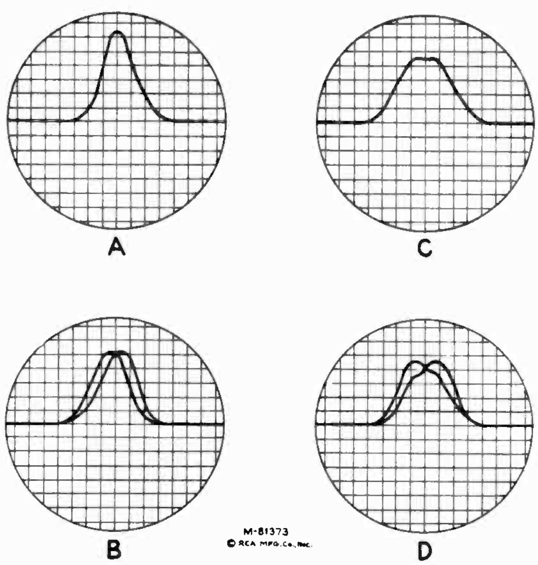


Figure 6—I-F Alignment Oscillograph Curves

A—**Correct** curve showing proper i-f alignment as obtained with fidelity control counter-clockwise.

B—**Incorrect** curve similar to A showing improper alignment of i-f system caused by one or more circuits being slightly detuned.

C—Correct showing broadening of curve A obtained when fidelity control is rotated fully clockwise.

D—**Incorrect** curve showing broadening of curve B obtained when fidelity control is rotated fully clockwise.

(e) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(f) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(g) With the images established as in (f), re-adjust the two magnetite core screws **L30** and **L29** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

(h) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the RCA-6K7 first i-f tube (with grid lead in place), through a **.001-mfd.** capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (g) above.

(i) The two second i-f transformer magnetite core screws **L28** and **L27** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(j) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the RCA-6L7 first-detector, (with grid lead in place) through a **.001-mfd.** capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (i) above.

(k) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to become coincident throughout their lengths and have maximum amplitude.

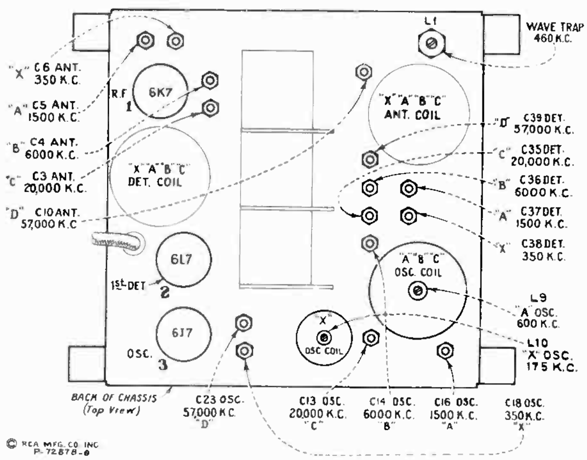
(l) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn receiver fidelity control to extreme clockwise position. Note width of oscillographic image at a point which is 50% of maximum amplitude. Under normal conditions the latter measurement should be approximately 60% greater in width than the former measurement. The image should also appear slightly double humped. These conditions indicate proper broadening of the band width of the i-f amplifier. Turn range selector to "Medium wave" (B) band and note increase of amplitude. The amplitude should increase several times. It may be necessary to decrease output of test oscillator to keep image on screen. Turn receiver fidelity control to extreme counterclockwise position and proceed to "R-F Adjustments."

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 12. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to



APPROX. DISTANCE IN INCHES-CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT.
D	1½	1⅞	1⅝
C	1 7/16	1⅛	1 1/16
B	1⅜	1⅛	1⅜
A	1½	1	1¼
X	1½	1 15/16	1 9/16

Figure 7—"Magic Brain" Trimmer Locations

the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment.

Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to the **57,000 kc** input signal (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings (**230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used as this places the test-oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc**) without altering test-oscillator adjustment. Test oscillator second harmonic of **14,-250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater than **28,500 kc,** the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11,** first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of L11 and L12 (see figure 4) nearer chassis. **Do not allow straps to touch chassis except where connected.** To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test-oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

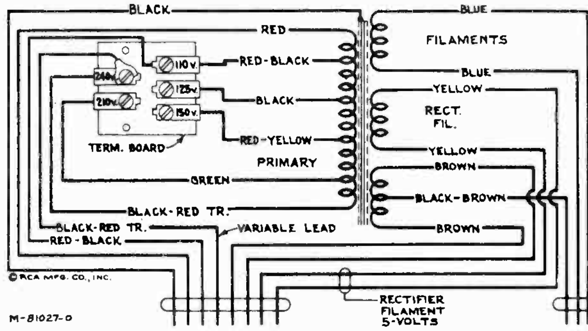
(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The image signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave Band"

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C4** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial



Primary resistance—3.6 ohms total
Secondary resistance—112 ohms total

Figure 8—Universal Transformer

pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc** (**1,500–3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37,** and **C5,** respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust air-trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc** (**200–400-kc** range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment. Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and

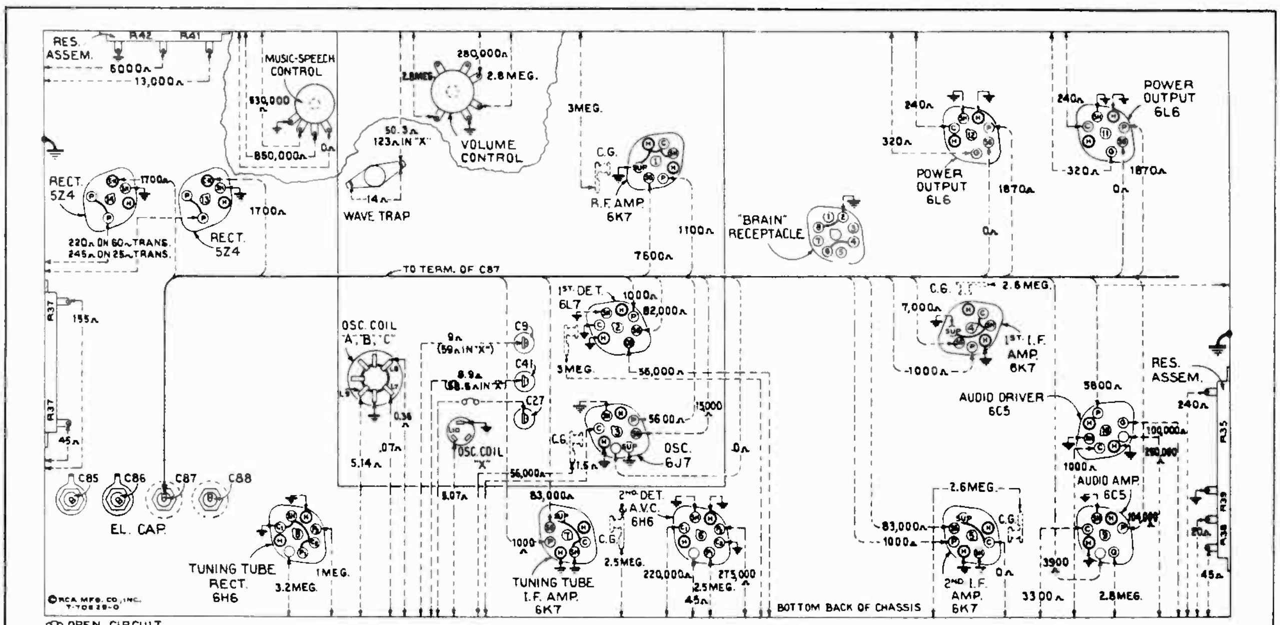


Figure 9—Resistance Diagram

Power supply disconnected—Radiotrons in sockets—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Volume control maximum—Fidelity control optional—Music-speech Control Clockwise

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground or other pertinent point on figure 9, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 2, and Wiring Diagrams, figures 3 and 4, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within $\pm$ 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.

C6, again, to produce maximum amplitude of the images where they best coincide throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Tuning Tube Adjustment

An adjustment, **R27,** is provided on the rear apron of chassis (see figure 1) for regulating the sensitivity of the tuning tube ("Magic Eye"). Adjustment may be performed by first tuning in the strongest local station and then turning adjusting screw until the width of the dark sector on the fluorescent screen in the RCA-6E5 tuning tube is very narrow ("Magic Eye" almost closed). No other adjustment is necessary.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminals under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F Amp.	6.2 ma.
(2)	RCA-6L7—1st Det.	4.0 ma.
(3)	RCA-6J7—Osc.	6.6 ma.
(4)	RCA-6K7—1st I-F Amp.	6.2 ma.
(5)	RCA-6K7—2nd I-F Amp.	7.5 ma.
(6)	RCA-6H6—2nd Det.—A.V.C.	——
(7)	RCA-6K7—Tuning Tube I-F Amp.	7.5 ma.
(8)	RCA-6H6—Tuning Tube Rect.	——
(9)	RCA-6C5—Audio Voltage Amp.	1.25 ma.
(10)	RCA-6C5—Audio Driver Amp.	6.4 ma.
(11)	RCA-6L6—Power Output	43.0 ma.
(12)	RCA-6L6—Power Output	43.0 ma.
(13)	RCA-5Z4—Rectifier	80 ma.*
(14)	RCA-5Z4—Rectifier	80 ma.*
(15)	RCA-6E5—Tuning Tube	3.0 ma.

(*Cannot be measured at socket)

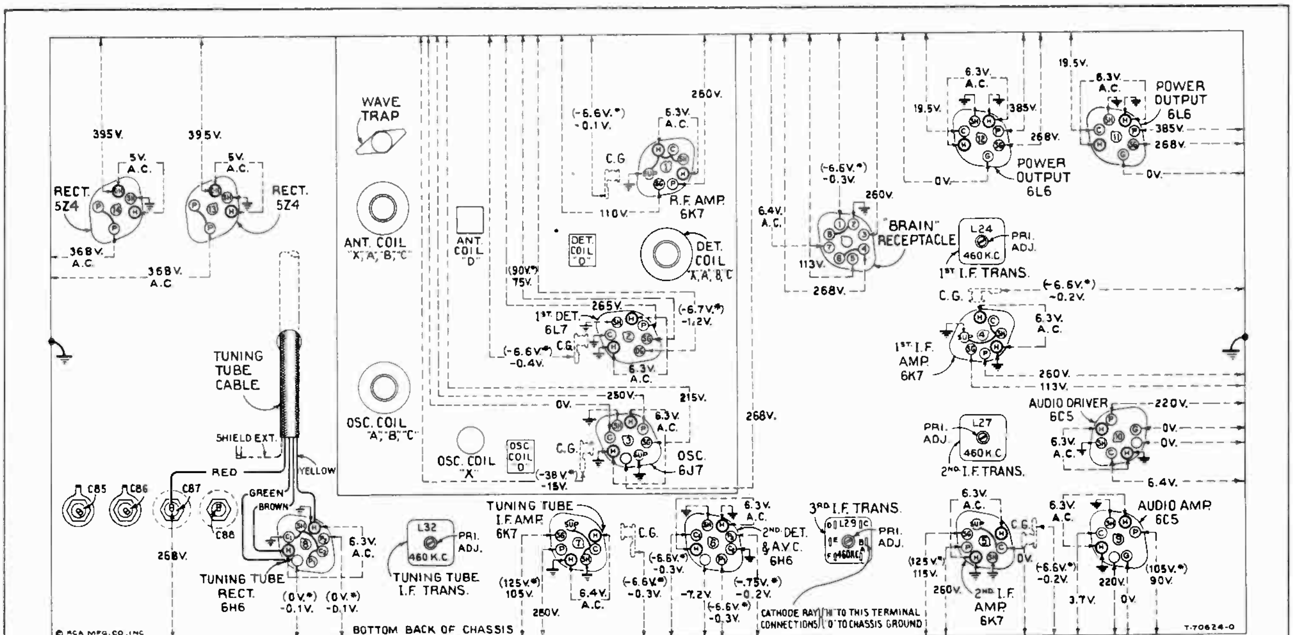


Figure 10—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Volume control minimum—Fidelity control optional

Radiotron Socket Voltages

***Note:** Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter through the high series circuit resistance.*

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to receiver chassis ground on figure 10 will assist in locating cause of faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

Phonograph Terminal Board

A terminal board is provided for connecting a phonograph into the audio amplifying circuit. Typical methods of connecting a low-impedance pickup, or the RCA Victor Models R-93, R-93-2, and R-93-S Record Players are shown on the Schematic Diagram (figure 2).

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This

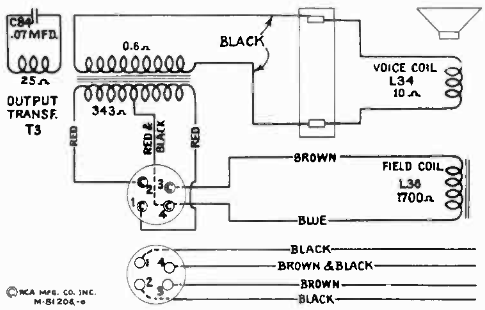


Figure 11—Loudspeaker Wiring

may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

Antenna and Ground Terminals

These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Selector Dial

Figure 12 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

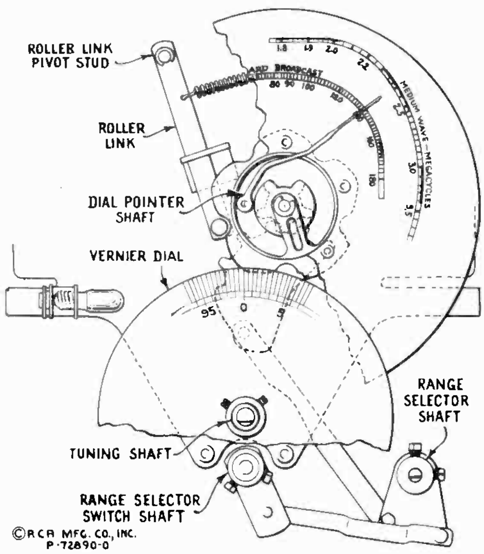


Figure 12—Selector Dial Change Mechanism

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES		4427	Bracket—Volume control and L. F. tone control mounting bracket	$0.18
12863	Board—Phonograph terminal board	$0.25	13024	Cable—Tuning lamp cable and socket	1.25
12987	Bracket—Mounting bracket for bias switch	.15	12511	Cap—Grid contact cap—Package of 5	.15

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
12629	Capacitor—56 Mmfd. (C59)	$0.20	5131	Resistor—2.2 Meg Carbon type 1/10 watt—Package of 5 (R26)	$0.75
12404	Capacitor—120 Mmfd. (C56, C58)	.26	12679	Resistor—2.2 Meg Insulated ¼ watt—Package of 5 (R22)	1.00
13021	Capacitor—150 Mmfd. (C68, C69)	.20	13017	Resistor—Voltage divider comprising one 7000 ohm and one 6000 ohm sections (R41, R42)	.90
13022	Capacitor—390 Mmfd. (C70)	.25	13018	Resistor—Voltage divider comprising one 240 ohm, one 20 ohm and one 25 ohm sections (R35, R38, R39)	.55
13034	Capacitor—390 Mmfd. (C73)	.25	4669	Screw—No. 8-32-x5/32 set screw for link assembly Stk. No. 12868—Package of 10	.25
13301	Capacitor—390 Mmfd. (C46, C47, C51, C52)	.25	12008	Shield—I. F. transformer shield for Stk. No. 12981, 12990, 13019 and 13020	.28
12898	Capacitor—1500 Mmfd. (C78)	.20	12581	Shield—Transformer shield top for Magic Eye I. F. transformer	.36
13580	Capacitor—1800 Mmfd. (C89)	.25	12607	Shield—Transformer shield top for first or second I. F. transformer	.30
13033	Capacitor—.007 Mfd. (C82, C83)	.20	13028	Shield—Transformer shield top for third I. F. transformer	.20
4870	Capacitor—.025 Mfd. (C71)	.20	11195	Socket—5 contact 5Z4 Radiotron socket	.15
4858	Capacitor—.01 Mfd. (C53, C45, C48, C49, C50, C54, C55, C57, C60, C66, C67, C74)	.25	11198	Socket—7 contact 6K7 or 6L6 Radiotron socket	.15
4937	Capacitor—.01 Mfd. (C81)	.25	11196	Socket—8 contact 6C5 or 6H6 Radiotron and Magic Brain power supply socket	.15
4836	Capacitor—.05 Mfd. (C64, C77)	.30	11381	Socket—Tuning lamp socket and cover	.45
4841	Capacitor—0.1 Mfd. (C65)	.22	13095	Socket—Upper left or lower right hand dial lamp socket	.25
11203	Capacitor—10 Mfd. (C85, C86)	1.18	11222	Socket—Upper right or lower left hand dial lamp socket	.18
5212	Capacitor—18 Mfd. (C87, C88)	1.16	12007	Spring—Retaining spring for core Stk. No. 12006—Package of 10	.36
12470	Capacitor—20 Mfd. (C79)	1.10	12986	Stud—Stud, nut and washer for connecting link assembly Stk. No. 12868 to sector gear and link Stk. No. 12910—Package of 5	.65
13011	Capacitor—Compensating pack comprising two .015 Mfd., one .007 Mfd. capacitors and two 27,000 ohm, one 33,000 ohm, and one 68,000 ohm resistors (C61, C62, C63, R17, R18, R19, R20)	2.00	12988	Switch—Bias switch (S7)	.65
13025	Capacitor—Pack comprising two 10 Mfd. sections (C72, C75)	1.00	13015	Tone Control—Fidelity control (R34, S4, S6)	1.00
5040	Connector—4 contact female connector for speaker cable	.25	13013	Tone Control—Music-speech and power switch (S5, S8)	1.15
13016	Control—Magic Eye control (R27)	.85	12981	Transformer—First I. F. transformer complete (L24, L25, L26, C46, C47)	2.15
12006	Core—Adjustable core and stud for Stk. Nos. 12981, 12990, 13019 and 13020	.22	12990	Transformer—Second I. F. transformer complete (L27, L28, C51, C52)	1.85
5240	Cover—Fuse mounting cover	.24	13019	Transformer—Third I. F. transformer complete (L29, L30, L31, C56, C58, C59, R21, R23)	2.00
12870	Dial—Vernier dial scale	.65	13023	Transformer—Driver transformer (T2)	2.25
10907	Fuse—3 Amp.—Package of 5—(F1)	.40	13020	Transformer—Magic Eye I. F. transformer complete (L32, L33, C68, C69, C70)	2.00
5226	Lamp—Dial lamp—6.3 volts—Package of 5	.70	13008	Transformer—Power transformer 100-120 volts 50-60 cycles (T1)	7.55
12868	Link—Range switch and band indicator operating link complete with set screws	.45	13009	Transformer—Power transformer 100-120 volts 25-50 cycles (T1)	11.20
13012	Mounting—Fuse mounting 100-120 volt models only	.35	13010	Transformer—Power transformer 100-250 volts 50-60 cycles (T1)	12.65
13026	Mounting—Fuse mounting 220 volt models only	.35	13014	Volume Control—(R16)	1.00
13027	Resistor—110 ohm wire wound—used in 110 volt models only (R37)	.50		**MAGIC BRAIN UNIT ASSEMBLIES**	
13029	Resistor—140 ohm wire wound—used in 220 volt models only (R37)	.75	12806	Board—3 contact antenna and ground terminal board	.25
13030	Resistor—1,000 ohm Carbon type 1/10 watt—Package of 5 (R12, R25, R33)	.75	5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
5112	Resistor—1000 ohm Carbon type ¼ watt—Package of 5 (R10, R15)	1.00	12886	Cable—Shielded power cable approx. 4 in. long complete with 8 contact male plug	1.50
13031	Resistor—3300 ohm Carbon type 1/10 watt—Package of 5 (R29)	.75	12511	Cap—Grid contact cap—Package of 5	.15
13032	Resistor—3900 ohm Carbon type 1 watt—Package of 5 (R40)	1.10			
5114	Resistor—15,000 ohm Carbon type 1 watt—(R36)	.22			
11282	Resistor—56.000 ohms Carbon type 1/10 watt—Package of 5 (R21)	.75			
11365	Resistor—82,000 ohm Carbon type ¼ watt—Package of 5 (R14, R24)	1.00			
11281	Resistor—100,000 ohm Carbon type 1/10 watt—Package of 5 (R11, R13, R32)	.75			
12263	Resistor—100,000 ohm Insulated ¼ watt—Package of 5 (R30)	1.00			
12478	Resistor—150,000 ohm Carbon type 1/10 watt—Package of 5 (R31)	.75			
12264	Resistor—220,000 ohm Insulated ¼ watt—Package of 5 (R28)	1.00			
11398	Resistor—220,000 ohm Carbon type 1/10 watt—Package of 5 (R23)	.75			
12013	Resistor—1 Meg Carbon type 1/10 watt—Package of 5 (R43)	.75			

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS (Continued)

Stock No.	DESCRIPTION	List Price
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	$0.38
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1500 Mmfd. (C12)	.20
12729	Capacitor—1550 Mmfd. (C20)	.26
12728	Capacitor—4500 Mmfd. (C19)	.36
12897	Capacitor—4700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil "D" band (L13, L14	.60
12880	Coil—Detector coil and shield XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield X band only (L10)	.80
12890	Coil—Oscillator coil "D" band (L11, L12, L23)	.70
12889	Coil—R. F. Coil "D" band (L21, L22)	.65
12877	Condenser—3 gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8 contact male connector and cover for power cable Stk. No. 12886	.40
12664	Core—Adjustable core and stud for Stk. No. 12654	.22
12800	Core—Adjustable core and stud for Stk. 12709	.20
12882	Core—Adjustable core and stud for Stk. No. 12881	.20
11324	Resistor—560 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—Carbon type—1 watt (R6)	.22
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—Carbon type—1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
11397	Resistor—560,000 ohms—Carbon type—1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stk. Nos. 12879 and 12880	.22
12710	Shield—Coil shield for Stk. No. 12709	.28
12883	Shield—Coil shield for Stk. No. 12881	.20
11198	Socket—7 contact 6K7 Radiotron socket	.15
11279	Socket—7 contact 6L7 Radiotron socket	.20
12885	Socket—8 contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core Stk. Nos. 12664, 12800 and 12882—Package of 10	.36
12878	Switch—Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave trap complete (L1)	.75

Stock No.	DESCRIPTION	Price List
	DRIVE ASSEMBLIES	
10705	Ball—5/32 in. diameter steel ball for planetary drive—Package of 20	$0.25
10941	Ball—1/8 in. diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive complete including mounting bracket, drive, dial scale, and indicator less vernier dial Stk. No. 12870 and link Stk. No. 12868	4.40
12906	Gear—Anti-lash drive gear complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly complete with springs	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear stock Nos. 12905 and 12906—Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring—Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link stock No. 8051—Package of 5	.32
	REPRODUCER ASSEMBLIES	
8059	Board—Reproducer terminal board	.14
12640	Bracket—Output transformer mounting bracket	.18
12474	Cone—Reproducer cone and dust cap (L34)	6.80
11577	Coil—Field coil, magnet and cone support (L36)	12.00
5039	Connector—4 contact male connector for reproducer leads	.25
9719	Reproducer Complete	20.40
13007	Transformer—Output transformer (T3, C84)	3.80
	MISCELLANEOUS ASSEMBLIES	
11996	Bracket—Tuning tube mounting bracket and clamp	.22
12915	Crystal—Station selector escutcheon and crystal	1.30
12742	Escutcheon—Tuning tube escutcheon	.22
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small (vernier) station selector knob—Package of 5	.58
11347	Knob—Volume control, Fidelity control, music-speech and power switch, and range selector knob—Package of 5	.75
11210	Screw—Chassis mounting screw and washer assembly—Package of 4	.28
12916	Shield—Magic brain shield	.90
4982	Spring—Retaining spring for knob stock No. 12699—Package of 10	.50
11349	Spring—Retaining spring for knob stock Nos. 11347, 12700—Package of 5	.25

The prices quoted above are subject to change without notice.

RCA VICTOR MODEL 15U

Fifteen-Tube, Five-Band, A-C Phonograph-Radio

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X) .... 150-410 kc
"Standard Broadcast" (A) .... 530-1,800 kc
"Medium Wave" (B) .... 1,800-6,400 kc
"Short Wave" (C) .... 6,400-23,000 kc
"Ultra Short Wave" (D) .... 23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X) .... 175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A) .... 600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B) .... 6,000 kc (osc., det., ant.)
"Short Wave" (C) ...... 20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D). 57,000 kc (osc., det., ant.)

Intermediate Frequency .... 460 kc

RADIOTRON COMPLEMENT

(1) RCA-6K7 .... R-F Amplifier
(2) RCA-6L7 .... First Detector
(3) RCA-6J7 .... Heterodyne Oscillator
(4) RCA-6K7 .... First I-F Amplifier
(5) RCA-6K7 .... Second I-F Amplifier
(6) RCA-6H6 ...... Second Detector and A.V.C.
(7) RCA-6C5 .... Audio Voltage Amplifier
(8) RCA-6E5 ....."Magic Eye" Tuning Indicator
(9) RCA-6L7 .... Audio Volume Expander
(10) RCA-6C5 .... Audio Driver Amplifier
(11) RCA-6C5 .... Expander Amplifier
(12) RCA-6H6 .... Expander Rectifier
(13) RCA-2A3 .... Power Output
(14) RCA-2A3 .... Power Output
(15) RCA-5Z3 .... Full-Wave Rectifier

Pilot Lamps (6) .... Mazda No. 40, 6.3 volts, 0.15 ampere

POWER-SUPPLY RATINGS

		Radio Only	Total
Rating A-6	105-125 volts, 60 cycles	180 watts	205 watts
Rating A-5	105-125 volts, 50 cycles	180 watts	210 watts

For 220-volt operation, a step-down transformer (Stock No. 7217) must be used.

Fuse Rating .... 3 amperes

PHONOGRAPH

Type .... Automatic Record Ejector
Record Capacity ...... Seven 10-inch or Six 12-inch
Turntable Speed .... 78 R.P.M.
Type of Pickup .... Low-Impedance Magnetic
Pickup Impedance .... 100 ohms at 1,000 cycles

POWER-OUTPUT RATINGS

Undistorted .... 12 watts
Maximum .... 15 watts

LOUDSPEAKER

Type .... Super 12-inch Electrodynamic
Impedance (V.C.) .... 11¼ ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS

Height .... 34 inches
Width .... 48⅞ inches
Depth .... 18 11/16 inches

WEIGHTS

Net .... 222 pounds
Shipping .... 311 pounds
Chassis Base Dimensions .... 15 inches x 9¾ inches x 3 inches
Over-all Height of Chassis .... 9¼ inches
Amplifier Base Dimensions .... 16¼ inches x 7½ inches x 2¾ inches
Over-all Height of Amplifier .... 7⅝ inches

OPERATING CONTROLS

Radio .... (1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector (5) Fidelity
Phonograph .... (1) Turntable Switch, (2) Radio-Phono Transfer Switch, (3) Index, (4) Dynamic Amplifier, (5) Phonograph Volume

Tuning Drive Ratios .... 20 to 1 and 100 to 1

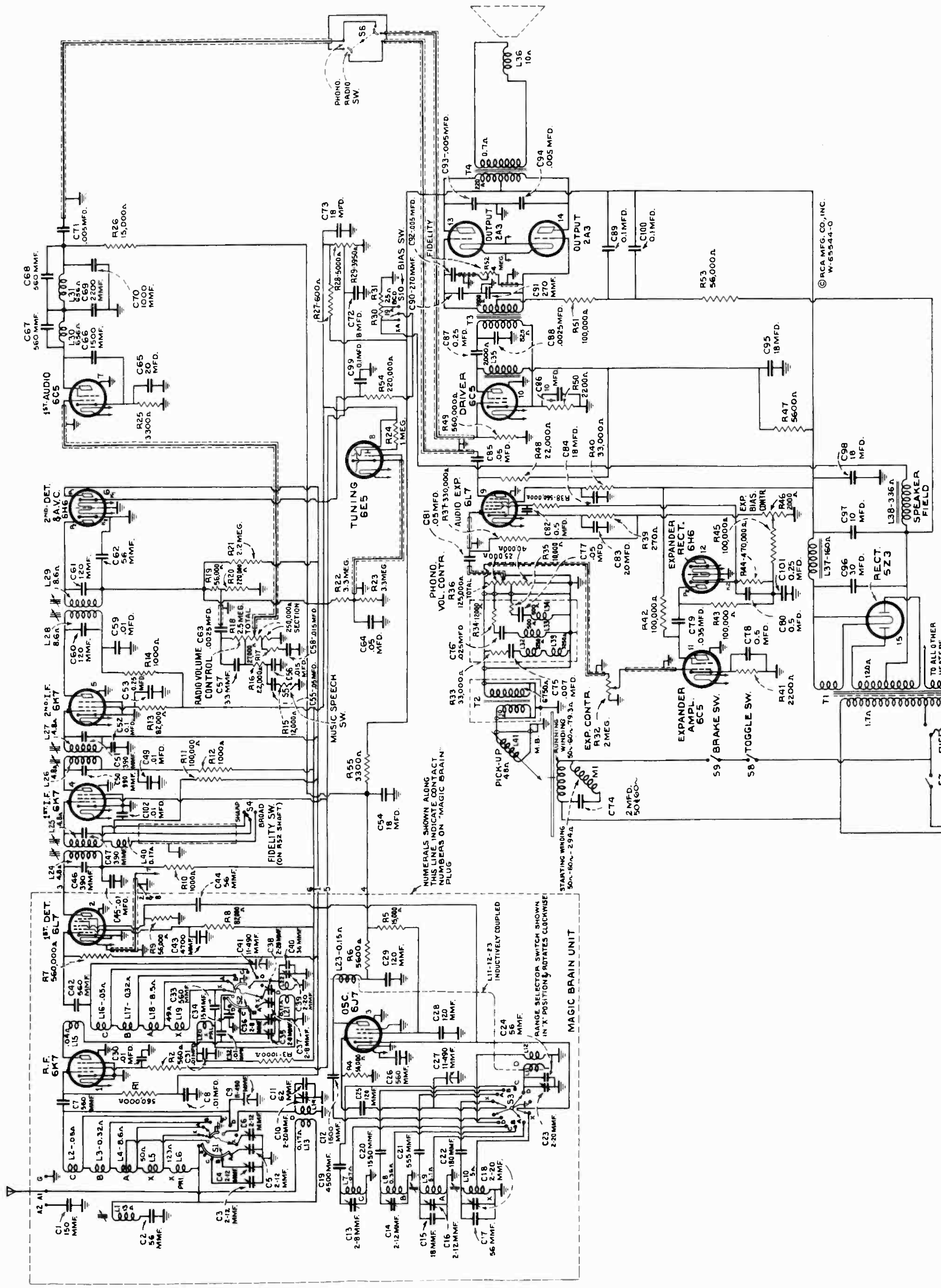


Figure 1—Schematic Circuit Diagram

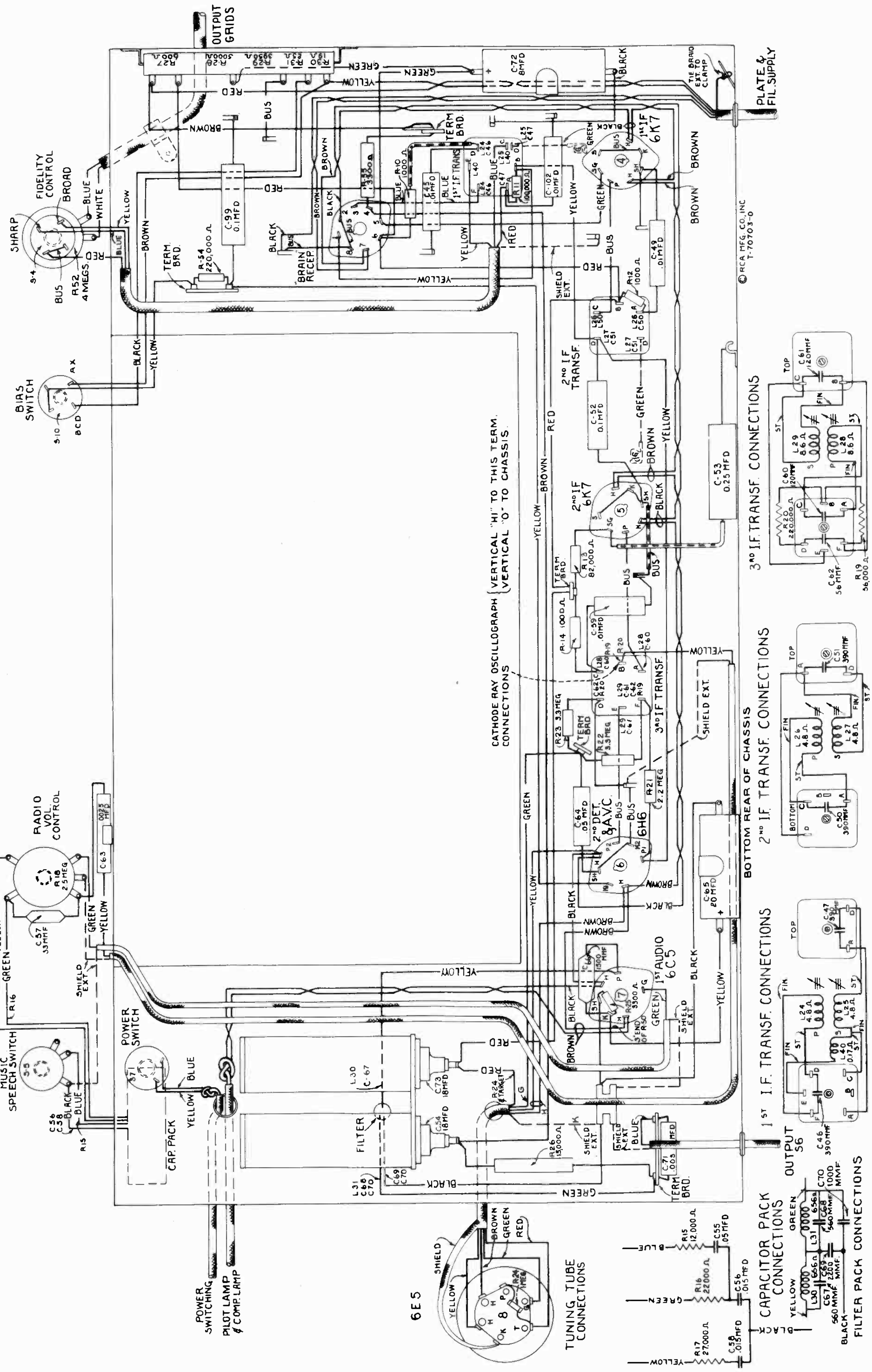


Figure 2—Receiver Chassis Wiring Diagram (Less "Magic Brain")

General Description

The Model 15U Phonograph-Radio Combination employs all of the latest developments in the art of record and radio reproduction. A few of the design features include higher-fidelity reproduction from both records and radio; the revolutionary dynamic expander; "Magic Brain"; improved automatic record changer; selector dial; "Magic Voice"; magnetite-core i-f transformers, wave-trap, and low-frequency oscillator tracking adjustments; new plunger-type air trimmers; and a super 12-inch electrodynamic loudspeaker with aluminum voice coil and high-frequency tone diffuser.

Circuit Arrangement

Phonograph

The voltage generated in the pickup L41 is applied across the phonograph volume control R36 through the pickup transformer T2 and the compensation pack. The arm of the volume control selects the amount of audio voltage applied to the control grid of the audio expander, RCA-6L7.

In order that full volume range reproduction may be realized from disc recordings, it is necessary that the gain of the audio expander be varied in direct proportion to the intensity of the recorded sound. To accomplish this, the expander control R32 is placed in shunt with the volume control, and the arm of the expander control connected to the control grid of the RCA-6C5 expander amplifier. The audio voltage applied to this tube is amplified and applied to diode plate No. P2 of the RCA-6H6 expander rectifier through capacitor C79. The rectified current develops a voltage across resistors R44 and R43. The voltage developed across R44 is applied to the No. 3 grid of the RCA-6L7 audio expander and varies the amplification of this tube so that the gain will be increased for loud passages and decreased for soft passages. The expander bias control R46 is used to adjust the residual bias on No. 3 grid of the audio expander.

The audio output of the RCA-6L7 audio expander is resistance-capacitance coupled to the audio driver RCA-6C5. The output of this tube is shunt fed to the primary of the interstage transformer T3 by means of reactance L5 and blocking capacitor C11. The audio signal developed across the secondary of T3 is applied to the control grids (push-pull) of the RCA-2A3 tubes for final power amplification. Bias for these tubes is developed across the loudspeaker field L38 and applied to the grids through resistance-capacitance filters. The output of the power-amplifier stage is transformer coupled to the voice coil of the electrodynamic loudspeaker.

Radio

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, two i-f amplifier stages, a diode-detector—automatic-volume-control stage, an audio voltage amplifier stage, an audio driver stage, a push-pull power output stage, and a full-wave rectifier stage.

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

The antenna couples to the RCA-6K7 r-f amplifier through a tuned antenna transformer. In the "Long wave" band, L6 acts as the primary while L5, L4, L3, and L2 act as the secondary. As bands are changed the sections of the coil are changed; the unused portions which resonate in the particular band in use are

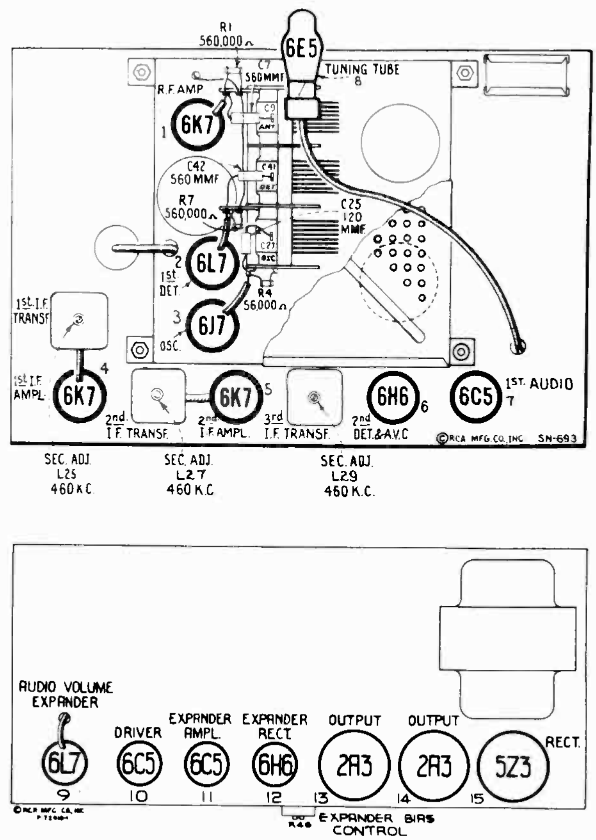


Figure 3—Radiotron and I-F Trimmer Locations

shorted out. This arrangement reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation. The "Ultra short wave" band employs a separate antenna transformer, L13 and L14. The output of the r-f stage is fed to the first detector RCA-6L7 grid No. 1 through a similar r-f transformer. The locally generated (heterodyne) oscillator signal is applied to grid No. 3 of this same tube.

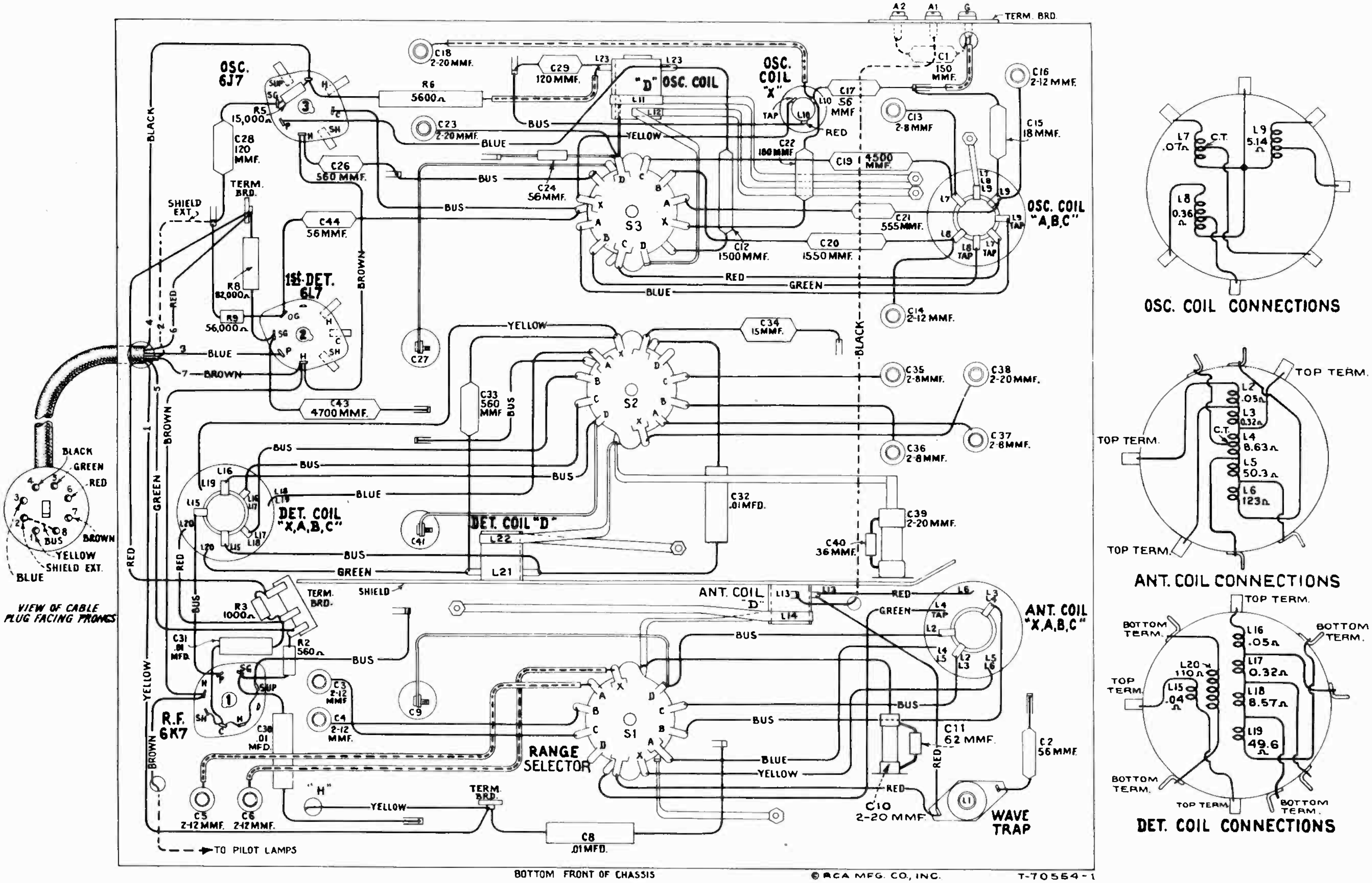


Figure 4—"Magic Brain" Wiring Diagram

The output of the first detector is fed through the i-f amplifier consisting of two RCA-6K7 Radiotrons and three magnetite core i-f transformers. The first i-f transformer has a third (tertiary) winding L40 which, when placed in series with the secondary L25 by the fidelity switch S4, broadens the i-f amplifier characteristic curve for higher-fidelity reception. The output of the i-f amplifier is detected by the No. 2 diode of the RCA-6H6 twin-diode tube. The audio frequency secured by this process develops a voltage across resistor R20 which is applied across the radio volume control R18 through capacitor C63. The voltage which develops across resistors R19 and R20 is applied as automatic control grid bias to the r-f, first detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode under such conditions draws current which flows through resistors R21, R19, and R20, thereby maintaining the desired operating bias. The sensitivity of the receiver is increased on the three high-frequency bands by reducing the residual bias on the above mentioned controlled tubes by switch S10 which is actuated by the range-selector control. The arm of the volume control R18 supplies audio signal voltage to the RCA-6C5 first-audio stage. The output of this stage is applied to the RCA-6C5 audio driver through a specially designed compensation filter network. The functions from this point on are the same as previously mentioned under "Phonograph" description.

The RCA-6E5 cathode-ray tuning tube provides a means of visually indicating when the receiver is accurately tuned to the incoming carrier. A portion of the signal voltage developed across resistors R19 and R20 is used to actuate the grid of the amplifier section of this tube. As the grid voltage increases negatively, the plate current is reduced and the indicating shadow becomes less. The correct point of tuning is indicated by the minimum width of the dark sector on the fluorescent screen.

Automatic Record Changer

An improved automatic mechanism, employing a synchronous motor, is used in these models. It is of the record ejector type, having a record capacity of seven for the ten-inch type, and a capacity of six for the twelve-inch type. The turntable speed is fixed at 78 r.p.m. by the design of the drive motor and the intermediate gear mechanism. *This speed is invariable and does not vary as long as the supply line frequency remains constant. It is very important that a machine of any particular rating be operated at the voltage and frequency for which it is designed and rated.* Attempts to operate on other voltages or frequencies will result in improper reproduction from the phonograph system and possible damage to the equipment. The ejecting mechanism is arranged so that it will trip on various types of records. This is obtained by having a trip mechanism which is actuated by the rate of needle acceleration toward the center of the record.

"Magic Voice"

This instrument is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker, giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and six adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining nine adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of these receivers necessitates a more or less involved method of align-

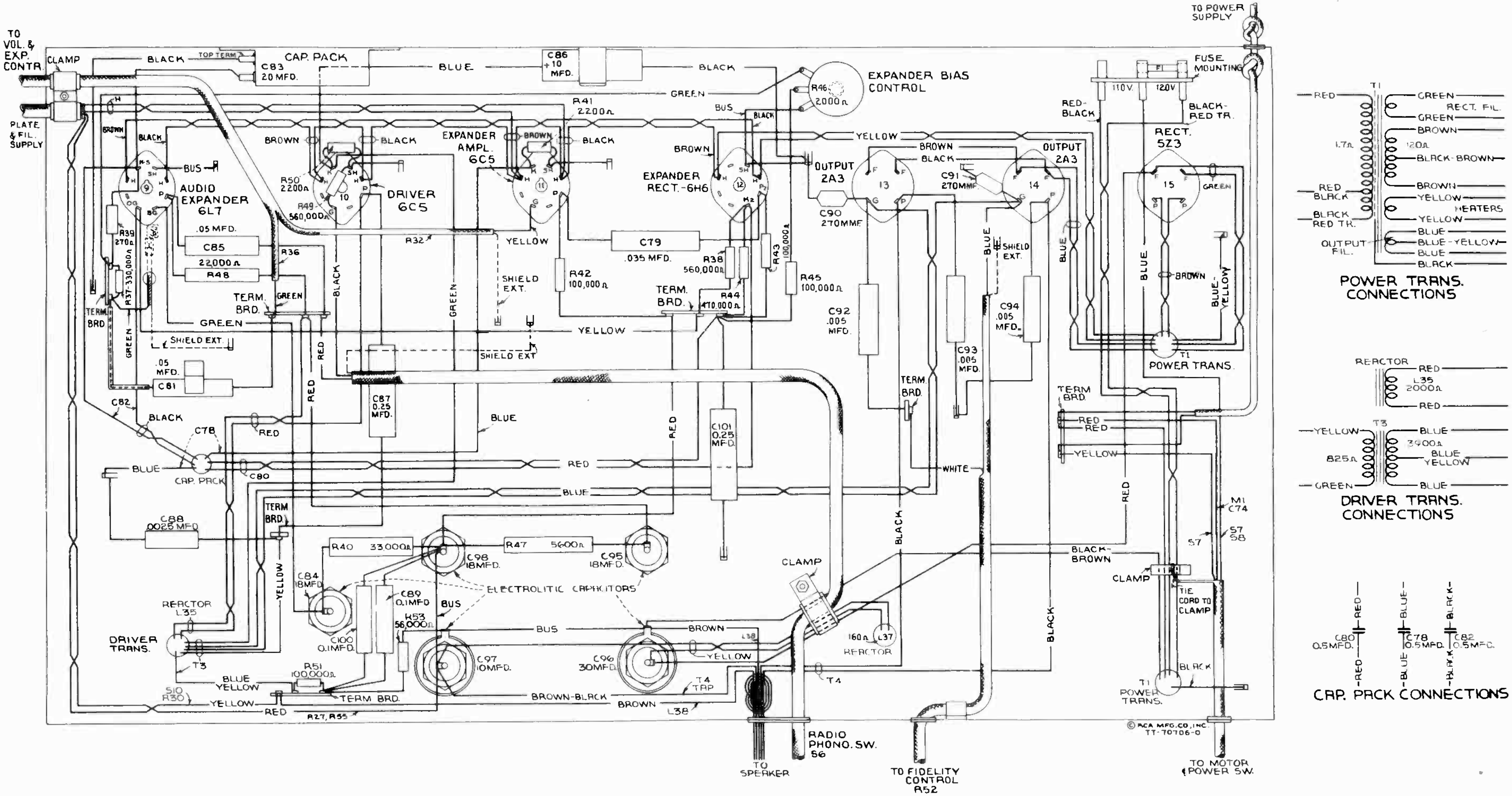


Figure 5—Power Amplifier Wiring Diagram

ment. However, if the following directions are carefully applied in the sequence given, normal performance of the instruments will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 8. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment
(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 8., Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are 920 kc apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency 460 kc below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous

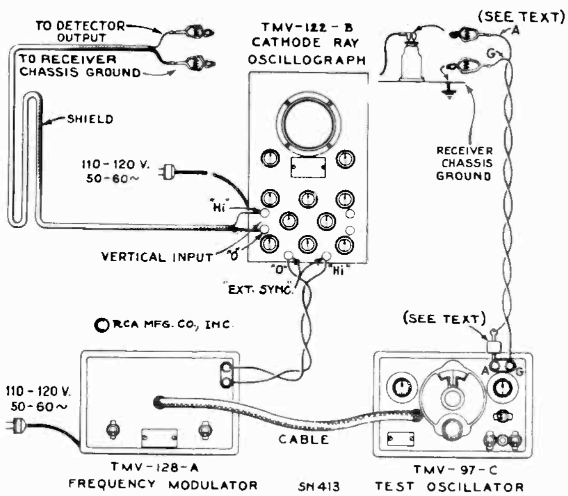


Figure 6—Alignment Apparatus Connections

in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of these receivers. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 6. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 2. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Set "Fidelity" control to counter-clockwise position, "Radio-Phono" switch to "Radio," and "Range Selector" to "Standard Broadcast" band. Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 second i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L29** and **L28** (see figures 3 and 11) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq." and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L29** and **L28** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

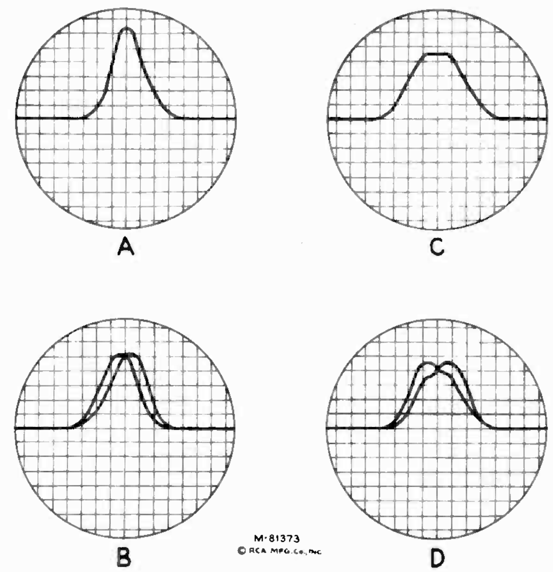


Figure 7—I-F Alignment Oscillograph Curves

A—**Correct** curve showing proper i-f alignment as obtained with fidelity control counter-clockwise.

B—**Incorrect** curve similar to A showing improper alignment of i-f system caused by one or more circuits being slightly detuned.

C—**Correct** showing broadening of curve A obtained when fidelity control is rotated fully clockwise.

D—**Incorrect** curve showing broadening of curve B obtained when fidelity control is rotated fully clockwise.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the RCA-6K7 first i-f tube (with grid lead in place), through a **.001-mfd.** capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two second i-f transformer magnetite core screws **L27** and **L26** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(i) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the RCA-6L7 first-detector, (with grid lead in place) through a **.001-mfd.** capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (h) above.

(j) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to become coincident throughout their lengths and have maximum amplitude.

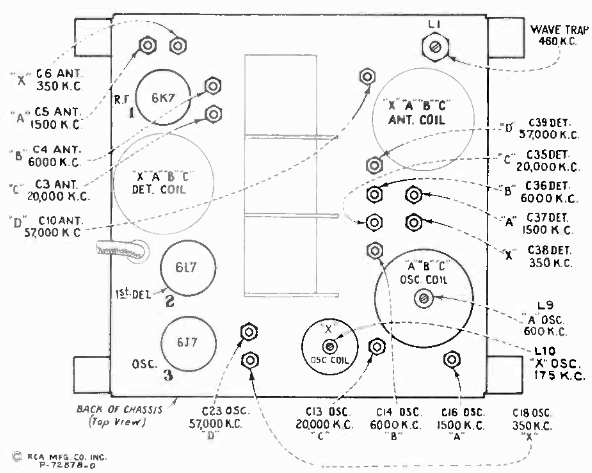
(k) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn receiver fidelity control to extreme clockwise position. Note width of oscillographic image at a point which is 50% of maximum amplitude. Under normal conditions the latter measurement should be approximately 60% greater in width than the former measurement. The image should also appear slightly double humped. These conditions indicate proper broadening of the band width of the i-f amplifier. Turn range selector to "Medium wave" (B) band and note increase of amplitude. The amplitude should increase several times. It may be necessary to decrease output of test oscillator to keep image on screen. Turn receiver fidelity control to extreme counter-clockwise position and proceed to "R-F Adjustments."

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 14. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator



APPROX. DISTANCE IN INCHES—CHASSIS BASE TO TOP OF TRIMMER PLUNGER

BAND	OSC.	DET.	ANT
D	1 1/2	1 7/8	1 5/8
C	1 7/16	1 1/8	1 1/16
B	1 3/8	1 1/8	1 3/8
A	1 1/2	1	1 1/4
X	1 1/2	1 15/16	1 9/16

Figure 8—"Magic Brain" Trimmer Locations

to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment.

Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39**, while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings **(230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for maximum response at a dial setting of approximately **28,500 kc** (image should tune in at a dial setting approximately **27,580 kc**) without altering test-oscillator adjustment. Test-oscillator second harmonic of **14,250 kc** is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than **28,500 kc** indicates that the inductance of the oscillator secondary coil **L11** is too low and should be increased. If the receiver dial reading is greater than **28,500 kc**, the inductance of **L11** is too high and should be decreased. If it is necessary to change the inductance of **L11**, first remove bottom cover of "Magic Brain" and then set receiver dial pointer to **28,500 kc.** To decrease inductance, move the grounded ends (straps) of L11 and L12 (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at **28,500 kc** without changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near **L22** indicates that **L22** is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of **L22** may be varied by changing the spacing between the grounded end (strap) of **L22** and the strap connected from **C41** to contact on **S2** (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to **20,000 kc.** Adjust the test oscillator to **20,000 kc.** Adjust oscillator air-trimmer **C13** until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer **C35** until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C3** until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **19,080 kc.** The image signal should be received at this position indicating that the adjustment of **C13** has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to **6,000 kc.** Tune the test oscillator to **6,000 kc.** Adjust oscillator air-trimmer **C14** to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer **C36** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer **C4** to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the **300-ohm** resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a **200-mmfd.** capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to **600 kc.** Tune the test oscillator to **600 kc.** Adjust oscillator magnetite core screw **L9** (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to **1,500 kc.** Tune test oscillator to **1,500 kc (1,500–3,100-kc** range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers **C16, C37,** and **C5**, respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 1,680 kc.** Adjust trimmers **C16, C37,** and **C5** again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to **200 kc (200–400-kc** range). Tune receiver for maximum response to this signal at a dial reading of **approximately 600 kc.** The third harmonic of the **200-kc** signal is used for this adjustment Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increased frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of L9 core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the images and best coincident throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F Amp.	5.0 ma.
(2)	RCA-6L7—1st Det.	3.7 ma.
(3)	RCA-6J7—Osc.	7.0 ma.
(4)	RCA-6K7—1st I-F Amp.	5.0 ma.
(5)	RCA-6K7—2nd I-F Amp.	7.5 ma.
(6)	RCA-6H6—2nd Det.—A.V.C.	—
(7)	RCA-6C5—Audio Voltage Amp.	2.5 ma.
(8)	RCA-6E5—Tuning Tube	1.2 ma.
(9)	RCA-6L7—Audio Volume Exp.	7.5 ma.
(10)	RCA-6C5—Audio Driver	4.0 ma.
(11)	RCA-6C5—Expander Amplifier.	1.9 ma.
(12)	RCA-6H6—Expander Rectifier	—
(13)	RCA-2A3—Power Output	41.8 ma.
(14)	RCA-2A3—Power Output	41.8 ma.
(15)	RCA-5Z3—Rectifier	165 ma.*

(*Cannot be measured at socket)

Dynamic Amplifier Adjustments

It is essential that correct voltages and currents exist at the RCA-6L7 audio expander stage in order that the expanding function may take place in the proper manner. A screw-driver adjustment is accordingly provided to regulate the RCA-6L7 control grid No. 3 bias to the correct operating value. Two methods of adjustment are applicable. Either method requires a normal voltage of 300 volts across the filter output. The one to be preferred (a) requires the use of an **RCA Stock No. 9633 Beat-Frequency Oscillator** or the equivalent, a 100-ohm resistor, a 200-ohm resistor, and a 1,000-ohm-per-volt a-c voltmeter (rectifier-type) having a "low" range of 1.0 volt and a "high" range of 250 volts or greater. The less accurate method (b) requires the use of an **RCA Stock No. 12353 Split-Plate Adapter,** and a suitable d-c milliammeter. Both of these procedures are outlined below. **CAUTION: Before using either method, be sure that power-supply fuse is in proper position for the line voltage.**

(a) **Preferred Method**

Turn power switch off. Connect the 200-ohm and the 100-ohm resistors in series between the beat-frequency oscillator terminals (upper "250" and "CT") with the 100-ohm resistor connected to "CT." Calibrate the beat-frequency oscillator, adjust it to 1,000 cycles, and reduce its output. Connect the 1,000-ohm-per-volt a-c voltmeter (1-volt range) to the beat-frequency oscillator terminals (upper "250" and "CT"). Remove the male plug from the receptacle on the shielded cable running between the input transformer T2 and the compensator pack (see figure 12). Connect beat-frequency oscillator terminal "CT" to the large pin on the male plug. Connect the junction of the 200-ohm and the 100-ohm resistors to the small pin on the male plug.

Adjust beat-frequency oscillator output until the voltmeter reads exactly 1.0 volt. Remove the voltmeter leads from beat-frequency oscillator terminals without disturbing any of the oscillator adjustments. Place the voltmeter to its 250-volt or greater range and connect it between the plate prongs of the two RCA-2A3 power-output tubes. Connections to the tube prongs may be made by stripping approximately ½ inch of insulation from the ends of two short leads of rubber-covered wire, wrapping one bare end around each plate prong (being careful not to allow the bare ends to short on the chassis when the tubes are placed in their sockets), and connecting the voltmeter to these leads. **CAUTION: Do not touch these plate connections after the power is turned on since the potential at these points is rather high and carelessness might result in a serious shock.**

Set the "Dynamic amplifier" and "Fidelity control" to their extreme counter-clockwise positions. Set the "Phonograph volume" control to its extreme clockwise position. Turn on power switch and allow a few minutes for the instrument to become stabilized. Adjust the expander-bias control R46, on rear apron of amplifier (see figure 3), until the voltmeter reads 195 volts. Turn "Phonograph volume" control to extreme counter-clockwise position. Transfer lead from the junction of the 200-ohm and the 100-ohm resistors to the beat-frequency oscillator (upper "250") terminal without disturbing any of the oscillator adjustments. Adjust "Phonograph volume" control until the voltmeter reads 50 volts. Turn the "Dynamic amplifier" control to its extreme clockwise position allowing maximum expansion to take place. The voltmeter should now read not less than 150 volts if the expander circuit is operating correctly. Failure to do so indicates a defect in the system and the usual service procedure should be followed.

(b) Alternate Method

Turn power switch off. Place **RCA Stock No. 12353 Split-Plate Adapter** under the RCA-6L7 audio-volume expander. Connect a suitable d-c milliammeter to the adapter. Turn both the "Phonograph volume" and the "Dynamic amplifier" controls to their extreme counter-clockwise positions. Turn on power switch and allow a few minutes for the instrument to become stabilized. Adjust expander bias control R46, on rear apron of amplifier (see figure 3), to give 1.0 milliampere of plate current with no signal input to the dynamic amplifier.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

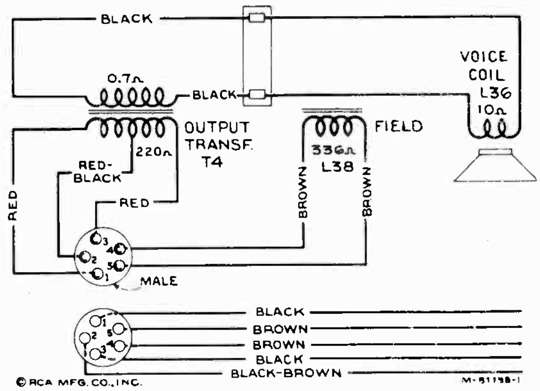


Figure 9—Loudspeaker Wiring

Antenna and Ground Terminals

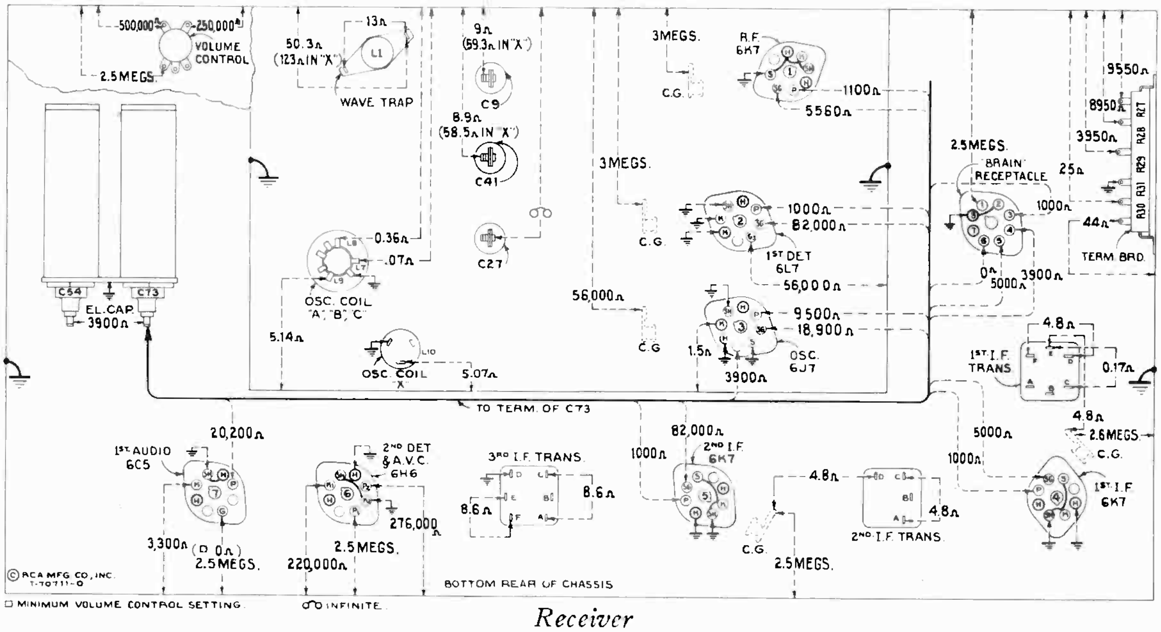
These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Selector Dial

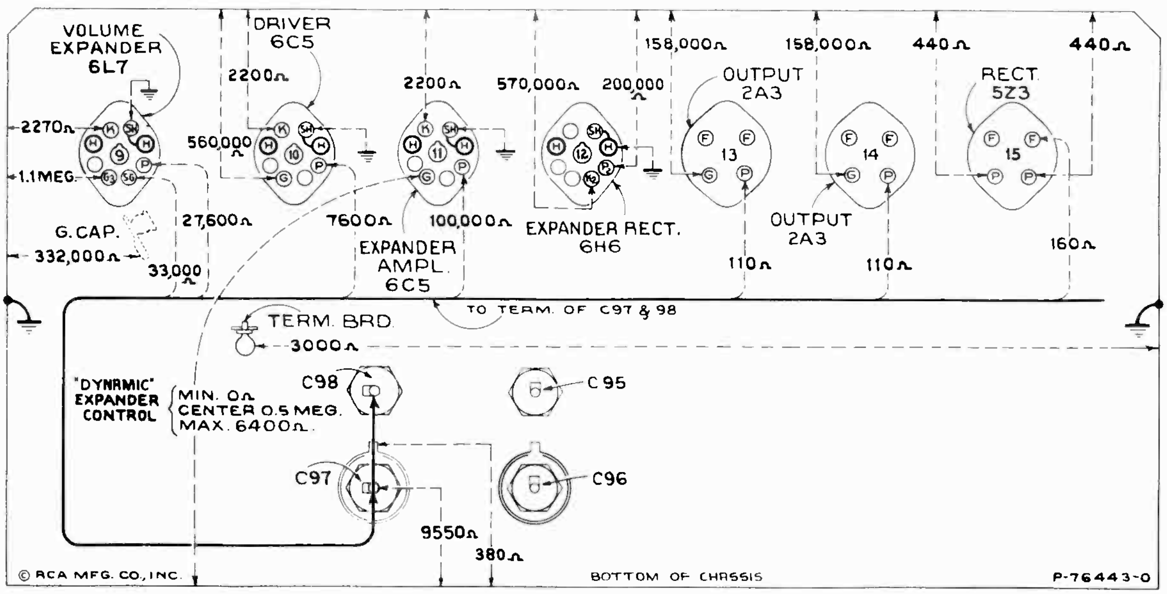
Figure 14 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-



Receiver



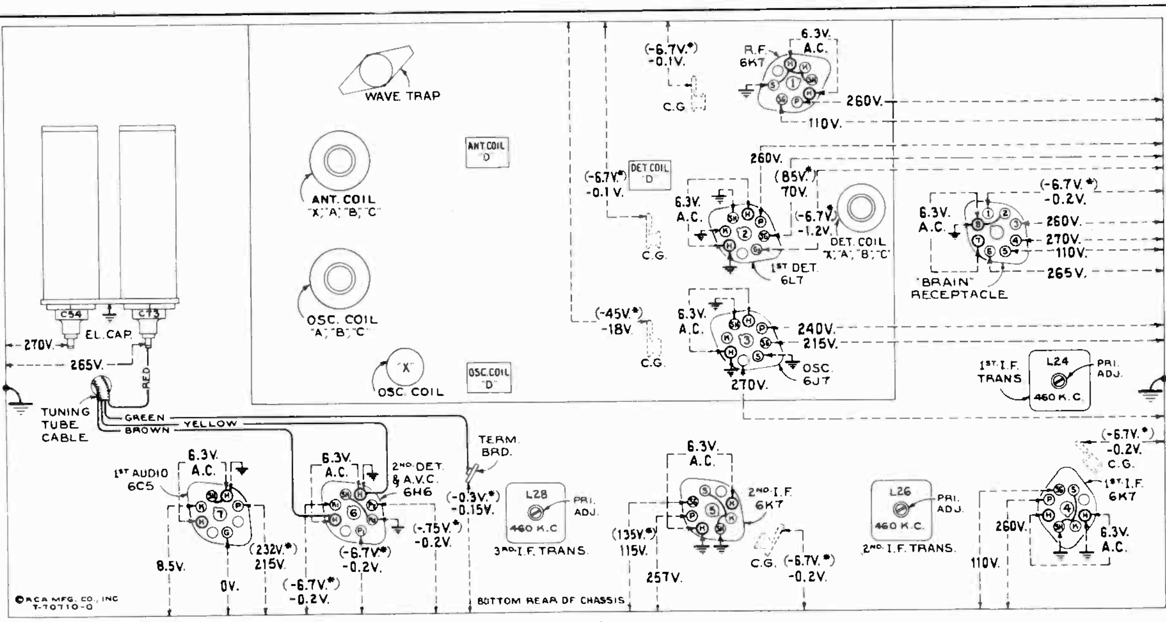
Power Amplifier

Figure 10—Resistance Diagram

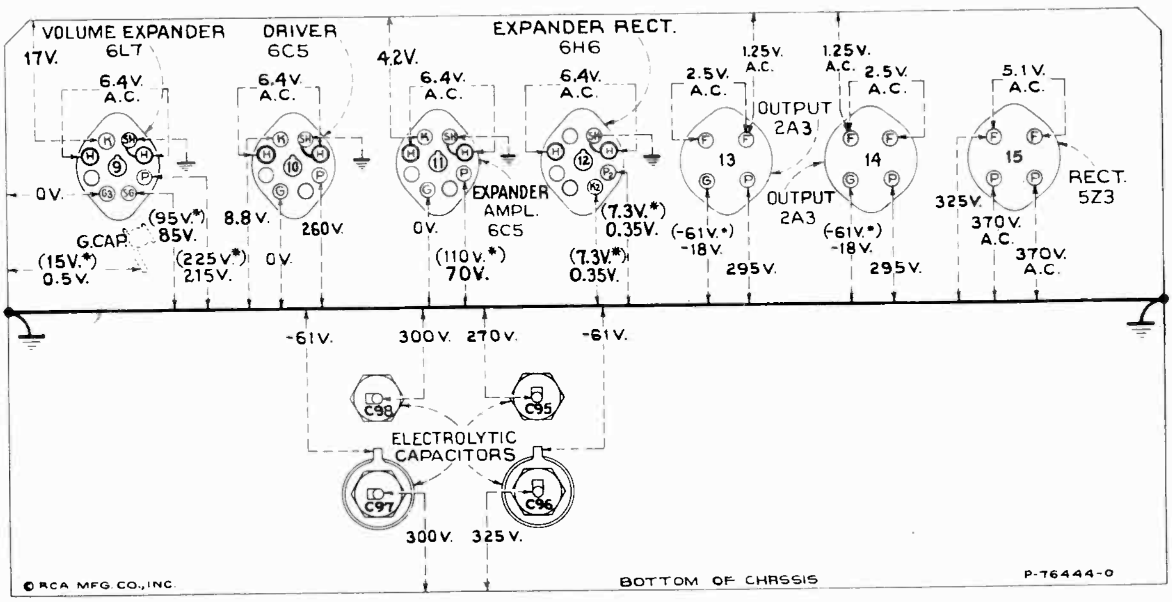
Power supply disconnected—Radiotrons in sockets—All cables connected—Tuning condenser in full-mesh —Range selector in "Standard broadcast" position —Both volume controls maximum—Radio-Phono switch either position

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to chassis ground or other pertinent point on figure 10, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagrams, figures 2, 4, and 5, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.



Receiver



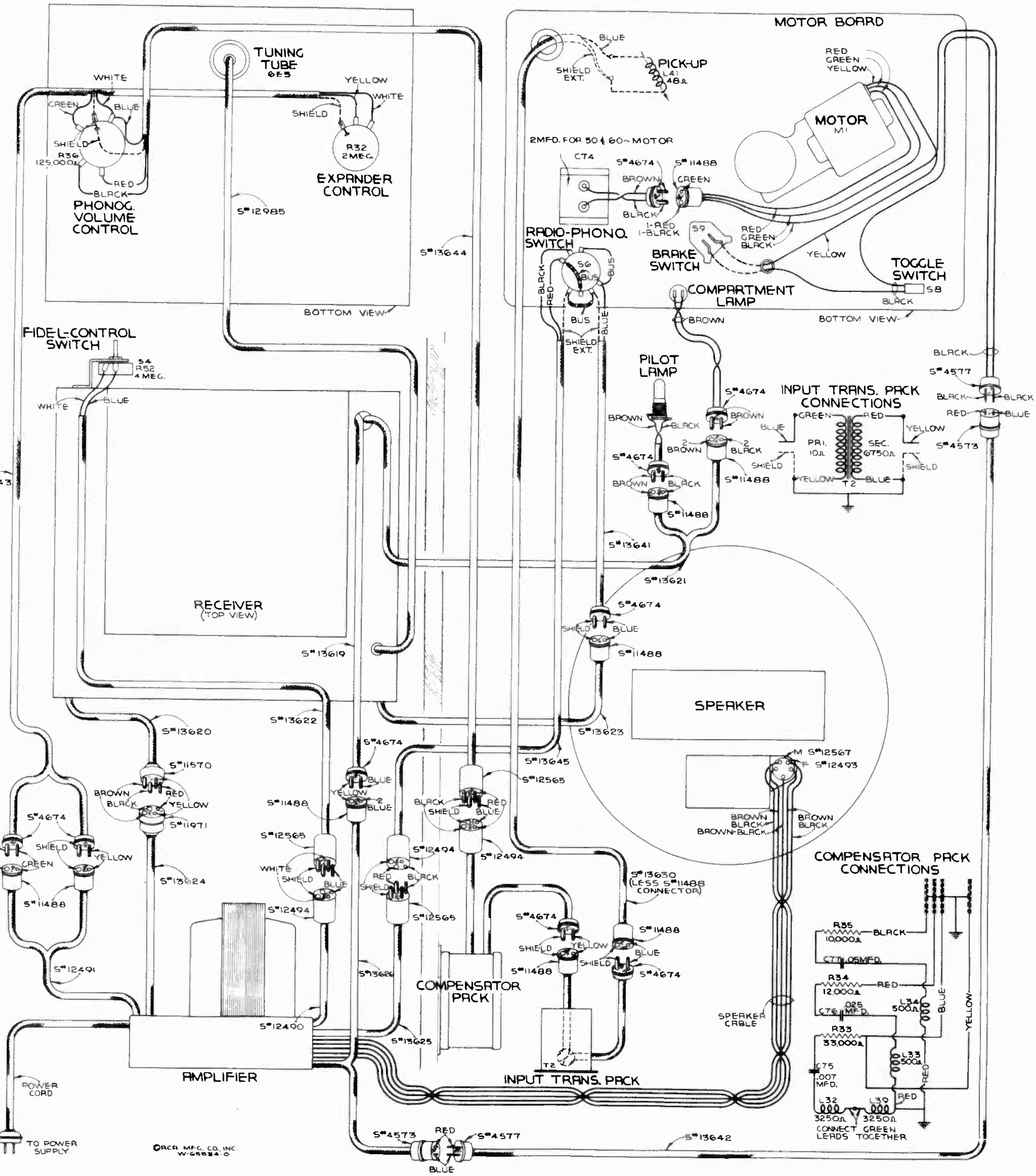
Power Amplifier

Figure 11—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations
Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Both volume controls minimum—Radio-Phono switch either position

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parenthesis because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to chassis ground on figure 11 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.



THE 'S' NUMBER ADJACENT CABLES AND PLUGS INDICATES STOCK NUMBER
ALL CABLES COMPLETE WITH PLUGS UNLESS OTHERWISE NOTED ADJACENT 'S' NUMBER

Figure 12—Assembly Wiring

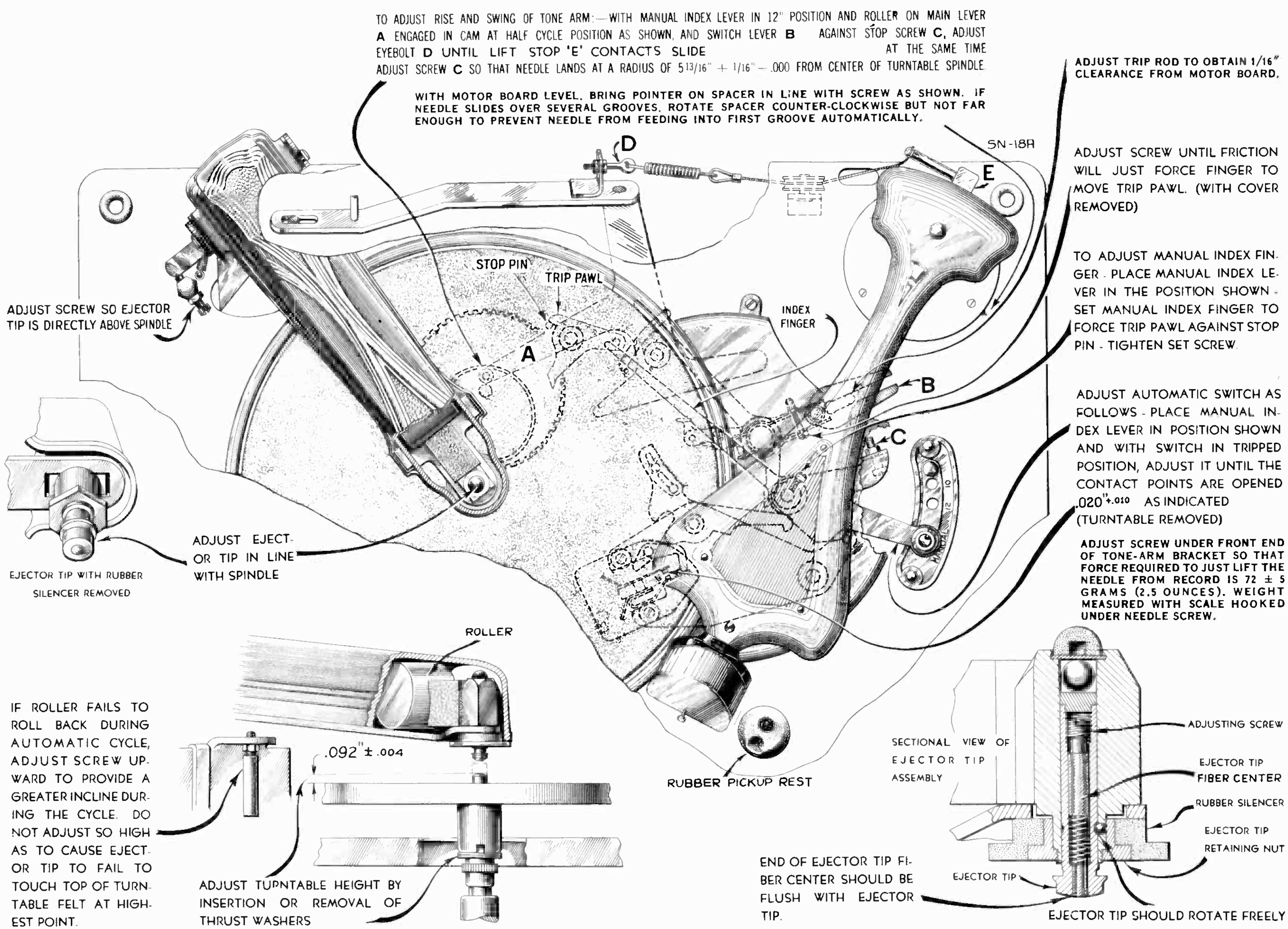


Figure 13—Automatic Record Changer Adjustments

(Lubricate motor bearings with light machine oil) frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

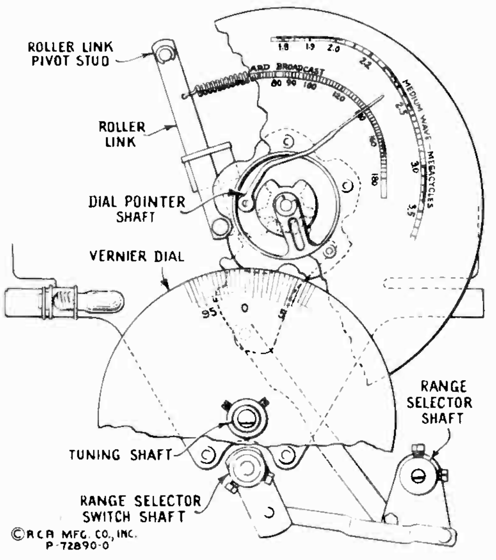


Figure 14—Selector Dial Change Mechanism

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows.

Centering Armature

Refer to figure 15 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly cleaned with fine emery cloth. Then insert the new block so that it occupies the same position at it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in figure 16 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

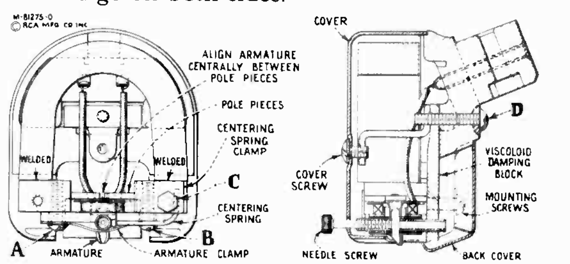


Figure 15—Details of Pickup

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to re-adjust the armature as previously explained after re-assembly of the mechanism. Only rosin core solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. To do this, it will be necessary to first remove the pickup

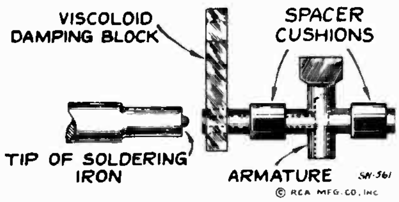


Figure 16—Special Soldering-Iron Tip

mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

Automatic Record Ejector

The record changing mechanism is designed to be simple and fool-proof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 13.

It is important when servicing the automatic mechanism, to have it placed on a level support. It is also important to refrain from forcing the mechanism if there is a tendency to bind or jam, since bent levers and possibly broken parts may result.

The tip of the record ejector is adjustable in relation to the turntable spindle, the two being exactly coaxial when properly adjusted. To align the tip, remove the rubber silencer of the ejector assembly, loosen ejector tip retaining nut and slide the tip assembly to the position where it is in true-line with the axis of the turntable spindle. This adjustment may be simplified by placing several records on the turntable, depressing the spindle through the top record hole and lining up the ejector tip in the spindle hole of the record.

To insure that the ejector tip rotates freely, apply a slight amount of oil to the shank of the tip at the point where it is in contact with the ball bearing.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control mounting bracket	$0.18
12987	Bracket—Band changeover switch bracket	.15
12511	Cap—Grid contact cap—Package of 5	.15
12948	Capacitor—33 Mmfd. (C57)	.20
12629	Capacitor—56 Mmfd. (C62)	.20
12404	Capacitor—120 Mmfd. (C60, C61)	.26
13022	Capacitor—390 Mmfd. (C46, C47, C50, C51)	.25
12898	Capacitor—1500 Mmfd. (C66)	.20
13608	Capacitor—.0025 Mfd. (C63)	.30
4868	Capacitor—.005 Mfd. (C71)	.20
13138	Capacitor—.01 Mfd. (C45, C49, C59, C102)	.25
4836	Capacitor—.05 Mfd. (C64)	.30
4841	Capacitor—0.1 Mfd. (C52, C99)	.22
4840	Capacitor—0.25 Mfd. (C53)	.30
13610	Capacitor—8 Mfd. (C72)	1.00
5212	Capacitor—18 Mfd. (C54, C73)	1.16
13611	Capacitor—20 Mfd. (C65)	.85
13613	Compensator Pack—Comprising two .015 Mfd., one .05 Mfd. capacitors and one 27,000 ohms, one 22,000 ohms, one 12,000 ohms resistors (C55, C56, C58, R15, R16, R17)	1.20
12006	Core—Core and stud assembly for intermediate frequency transformers	.22
13612	Filter Pack—Comprising two .453 Henry Chokes, two 560 Mmfd., one 1,000 Mmfd. and one 2,200 Mmfd. capacitors (L30, L31, C67, C68, C69, C70)	2.95
12866	Foot—Chassis foot assembly—Package of 2	.75
4340	Lamp—Pilot lamp—Package of 5	.60
12868	Link—Link mechanism on band indicator operating arm	.45
13609	Resistor—Voltage divider—Comprising one 600 ohms, one 5,000 ohms, one 3,950 ohms, one 25 ohms and one 19 ohms sections (R27, R28, R29, R30, R31)	.95
12311	Resistor—1,000 ohms—insulated, ¼ watt (R12)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type, ¼ watt (R10, R14)—Package of 5	1.00
5147	Resistor—3,300 ohms—carbon type, 1 watt (R55)	.22
12312	Resistor—3,300 ohms—insulated, ¼ watt (R25)—Package of 5	1.00
5114	Resistor—15,000 ohms—carbon type, 1 watt (R26)	.22
11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R19)—Package of 5	.75
11365	Resistor—82,000 ohms—carbon type, ¼ watt (R13)—Package of 5	1.00
11281	Resistor—100,000 ohms—carbon type, 1/10 watt (R11)—Package of 5	.75
5158	Resistor—220,000 ohms—carbon type, ¼ watt (R54)—Package of 5	1.00
11398	Resistor—220,000 ohms—carbon type, 1/10 watt (R20)—Package of 5	.75
12013	Resistor—1.0 megohm—carbon type, 1/10 watt—located in tuning tube socket (R24)—Package of 5	.75
12679	Resistor—2.2 megohm—insulated, ¼ watt (R21)—Package of 5	1.00
12874	Resistor—3.3 megohm—carbon type, ¼ watt (R22, R23)—Package of 5	1.00
12870	Scale—Vernier dial scale	.65
12008	Shield—Intermediate frequency transformer shield	.28
12607	Shield—1st or 2nd I.F. transformer shield top	.30
12581	Shield—3rd I.F. transformer shield top	.36
11197	Socket—6-contact 6C5 Radiotron socket	.14
11198	Socket—7-contact 6K7 or 6H6 Radiotron socket	.15
13095	Socket—Upper left or lower right-hand dial lamp socket	.25
11222	Socket—Upper right or lower left-hand dial lamp socket	.18
11381	Socket—Tuning tube socket and cover	.45
11196	Socket—8-contact R.F. unit voltage supply socket	.15
12007	Spring—Retaining spring for core in I.F. transformer—Package of 10	.36
12986	Stud—Band indicator operating arm stud—Package of 5	.65

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12860	Switch — Low frequency tone and power switch (S5, S7)	1.50
12988	Switch—Bias switch (S10)	.65
13616	Tone control — High frequency tone and fidelity control (R52, S4)	1.40
12981	Transformer—First intermediate frequency transformer (L24, L25, L40, C46, C47).	2.15
12990	Transformer — Second intermediate frequency transformer (L26, L27, C50, C51)	1.85
12982	Transformer—Third intermediate frequency transformer (L28, L29, C60, C61, C62, R19, R20)	2.25
12861	Volume Control (R18)	1.00
	MAGIC BRAIN UNIT ASSEMBLIES	
12806	Board — 3-contact antenna and ground terminal board	.25
5237	Bushing — Variable condenser mounting bushing assembly—Package of 3	.43
12886	Cable — Shielded power cable, approximately 4 inches long, complete with 8-contact male plug	1.50
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	.38
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12896	Capacitor—15 Mmfd (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29).	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1,500 Mmfd. (C12)	.20
12729	Capacitor—1,550 Mmfd. (C20)	.26
12728	Capacitor—4,500 Mmfd. (C19)	.36
12897	Capacitor—4,700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield, XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil, "D" band (L13, L14)	.60
12880	Coil—Detector coil and shield, XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield, ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield, X band only (L10)	.80
12890	Coil—Oscillator coil, "D" band (L11, L12, L23)	.70
12889	Coil—R.F. coil, "D" band (L21, L22)	.65
12877	Condenser—3-gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8-contact male connector and cover for power cable, Stock No. 12886	.40
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
11324	Resistor—560 ohms—carbon type, 1/4 watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type, 1/4 watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type, 1 watt (R6)	.22
3998	Resistor—15,000 ohms—carbon type, 1/4 watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—carbon type, 1/2 watt (R8)—Package of 5	1.00
11397	Resistor — 560,000 ohms — carbon type, 1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stock Nos. 12879, 12880	.22
12710	Shield—Coil shield for Stock No. 12709.	.28
12883	Shield—Coil shield for Stock No. 12881.	.20
11198	Socket—7-contact 6K7 Radiotron socket	.15
11279	Socket—7-contact 6L7 Radiotron socket	.20
12885	Socket—8-contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core, Stock Nos. 12664, 12800, 12882 — Package of 10	.36
12878	Switch — Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave-trap, complete (L1)	.75
	DRIVE ASSEMBLIES	
10705	Ball—5/32-inch diameter steel ball for planetary drive—Package of 20	.25
10941	Ball—1/8-inch diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly, complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive, complete, including mounting bracket drive, dial scale and indicator, less vernier dial, Stock No. 12870 and link, Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear, complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly, complete with spring	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear, Stock Nos. 12905 and 12906 — Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring — Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear, Stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link, Stock No. 8051—Package of 5	.32
	AMPLIFIER ASSEMBLIES	
12511	Cap—Grid contact cap—Package of 5	.15
12110	Cap—Top shield cap for 6L7 Radiotron	.14
12488	Capacitor—270 Mmfd. (C90, C91)	.14
5107	Capacitor—.0025 Mfd. (C88)	.16
4838	Capacitor—.005 Mfd. (C93, C94)	.20
4868	Capacitor—.005 Mfd. (C92)	.20
5196	Capacitor—.035 Mfd. (C79)	.18
4886	Capacitor—.05 Mfd. (C85)	.20
4518	Capacitor—.05 Mfd. (C81)	.52
4839	Capacitor—0.1 Mfd. (C89, C100)	.52
5170	Capacitor—.25 Mfd. (C87)	.25
4840	Capacitor—.25 Mfd. (C101)	.30
11240	Capacitor—10 Mfd. (C97)	1.08
12472	Capacitor—10 Mfd. (C86)	1.00
5212	Capacitor—18 Mfd. (C84, C95)	1.16
11496	Capacitor—18 Mfd. (C98)	1.15
12470	Capacitor—20 Mfd. (C83)	1.10
12467	Capacitor—30 Mfd. (C96)	1.40
12465	Capacitor—Capacitor pack, comprising 3 sections, each 0.5 Mfd. (C78, C80, C82)	1.50
11272	Clamp—Volume control or speaker cable clamp	.10
5240	Cover—Fuse cover	.24
12468	Expander—Control (R46)	1.00
10907	Fuse—3-ampere fuse (F1)—Package of 5.	.40
5239	Mounting—Fuse mounting	.36
12471	Plate—6L7 socket mounting plate assembly, less socket	.15
12466	Reactor—Filter reactor (L37)	2.35
13454	Resistor—270 ohms—insulated, 1/4 watt (R39)—Package of 5	1.00
12195	Resistor—2,200 ohms—insulated, 1/4 watt (R41, R50)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type, 1 watt (R47)	.22
11332	Resistor—22,000 ohms—carbon type, 1 watt (R48)—Package of 5	1.10
12487	Resistor—33,000 ohms—carbon type, 2 watt (R40)	.25

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12286	Resistor—56,000 ohms—insulated, 1/4 watt (R53)—Package of 5	1.00
12263	Resistor—100,000 ohms—insulated, 1/4 watt (R42, R43, R45, R51)—Package of 5	1.00
12452	Resistor—330,000 ohms—insulated, 1/4 watt (R37)—Package of 5	1.00
12285	Resistor—470,000 ohms—insulated, 1/4 watt (R44)—Package of 5	1.00
12486	Resistor—560.000 ohms—insulated, 1/4 watt (R38, R49)—Package of 5	1.00
4794	Socket—4-contact 5Z3 or 2A3 Radiotron socket	.15
11197	Socket—6-contact 6C5 Radiotron socket	.14
11198	Socket—7-contact 6H6 or 6L7 Radiotron socket	.15
12464	Transformer — Interstage transformer (T3, L35)	5.95
12463	Transformer—Power transformer, 105-125 volt. 50-60 cycle (T1)	8.58
	EJECT ARM ASSEMBLIES	
11541	Arm—Eject arm, complete	8.15
11533	Ball—1/16-inch diameter steel ball—Package of 10	.20
10129	Ball—3/16-inch diameter steel ball—Package of 20	.25
11529	Bearing—Ejector tip bearing and nut	.32
11538	Bracket—Eject arm bracket	1.72
11537	Collar—Eject arm shaft collar and set screw	.24
11540	Cover—Eject arm cover	1.52
11536	Cushion—Counter balance roller cushion located inside of eject arm	.14
4055	Post—Vertical adjustment post — located on eject arm bracket	.30
3729	Roller—Eject arm counter balance roller —located inside of eject arm	.45
4580	Screw—No. 6—32-3/16-inch square head set screw for eject arm collar — Package of 10	.25
11534	Screw—No. 8—36-7/32-inch special screw for eject arm tip center adjustment—Package of 10	.14
11535	Shaft and Collar—Eject arm vertical action shaft and collar assembly	.15
11528	Silencer—Ejector tip silencer	.14
4067	Spring — Ejector arm bracket spring — Package of 10	.30
11531	Spring—Ejector tip spring—Package of 10	.42
11530	Tip—Ejector tip with tip center, adjusting screw and cap	.32
11539	Yoke—Eject arm yoke assembly	.94
	PICKUP AND ARM ASSEMBLIES	
13627	Arm—Pickup arm, complete less pickup unit	8.45
11548	Back—Pickup back	.52
10941	Ball—Pickup arm pivot shaft ball bearing—Package of 20	.25
12543	Bracket — Pickup arm spring, adjusting bracket and screw	.12
13629	Cable—Pickup arm operating cable—Package of 5	1.20
12541	Coil—Pickup coil (L41)	.64
13630	Connector—Shielded pickup cable and connector assembly — approximately 43 inches long—less female connector	.45
11545	Cover—Pickup front cover	.22
11546	Cover—Pickup back cover with mounting screws	.14
12850	Damper—Damper assembly for pickup arm base—comprising one upper damper and bushing. one lower bushing and one lower bearing	.25
11723	Escutcheon—Pickup arm escutcheon	.62
14115	Mechanism—Comprising one armature and spring assembly, one armature clamp and one damper	1.35
13628	Pickup—Pickup unit, complete	7.00
12546	Plug—Pivot shaft bearing plug—Package of 2	.14
13631	Rod—Pickup arm trip rod and nut—Package of 5	.30
11549	Screw—Pickup front cover screw—Package of 10	.42
3387	Screw—Nut and washer for mounting pickup to arm—Package of 10	.50

Stock No.	Description	List Price
12539	Screw—Pickup needle screw—Package of 10	.20
12544	Spring — Pickup arm adjusting spring — Package of 10	.25
	OPERATING MECHANISM	
13632	Cam—Cam and gear assembly	2.60
6808	Clutch—Trip lever friction clutch	.30
11558	Cover—Metal cover for trip lever and friction finger assembly	.36
6809	Finger—Manual index lever finger assembly	.25
3670	Finger—Friction finger assembly	.32
11554	Lever—Manual index lever—less pin	.62
13633	Lever—Main lever and link assembly	1.75
11557	Lever—Main spring lever	.42
11555	Lever—Trip lever and friction clutch assembly	.94
6503	Pawl—Trip pawl assembly	.40
3672	Pin—Manual index lever pin	.42
13635	Plate—Eject arm actuating plate assembly	.75
4564	Screw—Manual index lever finger set screw Package of 10	.20
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
13637	Spacer—Pickup arm mounting spacer	.60
13638	Spring—Actuating spring—Package of 10	.40
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
4061	Spring—Main spring lever tension spring—Package of 10	.38
2893	Spring—Trip lever latch plate tension—Package of 10	.30
13634	Spring—Pickup arm cable tension spring—Package of 10	.35
3676	Spring—Cam and gear pawl tension spring —Package of 10	.52
13639	Spring—Cam and gear arm tension spring —Package of 10	.40
4125	Spring—Eject arm horizontal action tension spring—Package of 10	.42
13636	Stud—Pickup arm lift cable stud and nut—Package of 10	.40
2917	Washer—Spring washer—"U" type—Package of 10	.25
	MOTOR ASSEMBLIES	
9735	Motor—105-125 volts—25 cycles (M1)	49.50
9651	Motor—105-125 volts—50 cycles (M1)	35.35
9650	Motor—105-125 volts—60 cycles (M1)	35.35
12050	Suspension Spring — Motor mounting spring, washer, and stud assembly — Comprising six springs, six cup washers, three spring washers and three studs	.60
	AUTOMATIC SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate — Automatic brake latch plate — Package of 5	.40
10174	Springs—Automatic brake springs—Package of 2 sets	.50
6805	Switch Assembly—Automatic switch, complete	1.90
3322	Switch—Motor switch (S9)	.75
	MOTOR BOARD ASSEMBLIES	
11881	Base — Phonograph compartment lamp socket and base	.55
12051	Capacitor—2 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9650 or No. 9651 only (C74)	4.18
13101	Capacitor—4 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9735 only (C74)	5.05
4674	Connector—2-contact male connector for Stock Nos. 12051, 13101 or phono compartment lamp leads	.25
4577	Connector—2-contact male connector for motor cable	.30
11488	Connector—2-contact female connector for motor leads	.14
11542	Cover—Turntable cover	.88
11553	Escutcheon — Index escutcheon engraved "Manual—12—10"	.44
4340	Lamp—Phonograph compartment lamp—6.3 volts—Package of 5	.60

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
3764	Nut—Cap nut for motor board suspension assembly—Package of 4	.40
11551	Rest—Pickup rest	.14
3654	Roller—Pickup arm cable guide roller—Comprising bracket, roller and guide pin	.34
11711	Shade—Phonograph compartment lamp shade	.16
3763	Suspension Spring—Suspension spring, washer and bolt assembly for motor board—Comprising one bolt, two cup washers, two springs, two "C" washers and one cap nut	.42
4671	Switch—Operating switch—toggle type (S8)	.72
11599	Turntable—Complete	2.90
	REPRODUCER ASSEMBLIES	
13614	Coil—Field coil and magnet assembly (L38)	13.20
12474	Cone—Reproducer cone (L36)	1.35
12567	Plug—5-contact male reproducer plug	.22
9767	Reproducer—Complete	21.75
12568	Transformer—Output transformer (T4)	3.30
	MISCELLANEOUS CABLES AND PLUGS	
13644	Cable—3-conductor shielded compensation cable, approximately 33" long, complete with 4-contact male connector—connects compensator pack to phonograph volume control	2.20
12991	Cable—3-conductor shielded fidelity control cable, approximately 7¼" long—connects fidelity control to receiver	.50
13645	Cable—2-conductor shielded grid switching cable, approximately 18" long, complete with 4-contact female connector—connects radio-record switch to amplifier	1.25
13625	Cable—Shielded input cable, approximately 14" long, complete with 4-contact male connector—connects amplifier to radio-record switch	.50
13621	Cable—2-conductor pilot and compartment lamp cable, approximately 13" long, complete with two 2-contact female connectors	1.00
13626	Cable—3-conductor motor and power switch cable, approximately 7½" long, complete with two female connectors—connects amplifier to phonograph motor and receiver power switch	1.65
13642	Cable—2-conductor motor power cable, approximately 35" long, complete with one 2-contact male and one 2-contact female connectors—connects cable stock No. 13626 to motor leads	1.90
13623	Cable—Single conductor shielded output cable, approximately 5" long, complete with 2-contact female connector—connects receiver to radio-record switch	.55
13641	Cable—Single conductor shielded output cable, approximately 10½" long, complete with 2-contact male connector—connects radio-record switch to radio receiver	.60
13620	Cable—4-conductor plate and filament supply cable, approximately 9" long, complete with 4-contact male connector—connects receiver to amplifier power supply	1.05
13619	Cable—2-conductor power cable, approximately 27" long, complete with 2-contact male connector—connects power switch to amplifier	.60
13624	Cable—4-conductor plate and filament supply cable, approximately 6" long, complete with 4-contact female connector—connects amplifier power supply to receiver	1.25
13622	Cable—2-conductor shielded tone control cable, approximately 28" long, complete with 4-contact male connector—connects receiver tone control to amplifier	.75
12490	Cable—2-conductor shielded tone control cable, approximately 10" long, complete with female connector—connects amplifier to receiver tone control	.58
12985	Cable—Tuning lamp cable and socket	1.70
12491	Cable—2-conductor shielded volume control cable, approximately 7½" long, complete with 2 female connectors—connects amplifier to phonograph volume control and expander control	.68
13643	Cable—2-conductor shielded volume control cable, approximately 37½" long, complete with two 2-contact male connectors—connects phonograph volume control and expander control to amplifier	2.00
4674	Connector—2-contact male connector for cable stock Nos. 13619, 13641, 13643, pilot lamp socket leads, compensator pack or input transformer cables	.25
11488	Connector—2-contact female connector for cable stock Nos. 12491, 13621, 13623, 13626 or input transformer cable	.14
4577	Connector—2-contact male connector for cable stock No. 13642	.30
12565	Connector—4-contact male connector for cable stock Nos. 13622, 13625 or 13644	.20
4573	Connector—2-contact female connector with oblong openings for cable stock Nos. 13626 or 13642	.30
12493	Connector—Speaker cable 5-contact female connector	.20
12494	Connector—4-contact female connector for cable stock Nos. 12490, 13645 or compensator pack cable	.18
11570	Connector—4-contact male connector for cable stock No. 13620	.32
11971	Connector—4-contact female connector for cable stock No. 13624	.55
	MISCELLANEOUS ASSEMBLIES	
5211	Bolt—Speaker mounting bolt assembly—Package of 2	.24
4391	Box—Used needle box	.70
13615	Bracket—Tuning lamp mounting bracket and clamp	.25
13103	Cap—Pilot lamp cap and bull's-eye—Package of 5	.65
12560	Compensator Pack—Phonograph compensator pack complete with two shielded cables and connectors (L32, L33, L34, L39, C75, C76, C77, R33, R34, R35)	3.74
12915	Crystal—Station selector escutcheon and crystal	1.30
11580	Cover—Pilot lamp cover	.12
12742	Escutcheon—Tuning lamp escutcheon	.22
12552	Expander Control (R32)	1.06
4340	Lamp—Pilot lamp—6.3 volts—Package of 5	.60
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small vernier station selector knob—Package of 5	.58
11347	Knob—Low frequency tone control and power switch, radio-record switch, radio volume control, range switch, or high frequency tone control knob—Package of 5	.75
11582	Knob—Phonograph volume control or expander control knob—Package of 5	.50
11607	Receptacle—Needle card holder	.38
11829	Roller—Record pocket slide roller—Package of 2	.55
4560	Screw—Chassis mounting screw assembly (front)—Comprising one screw, one washer and one lock washer—Package of 10	.30
13102	Screw—Chassis mounting screw assembly (bottom)—Comprising one screw, two cushions, one spacer, one washer and one lock washer—Package of 2	.30
11573	Socket—Pilot lamp socket	.28
11349	Spring—Retaining spring for knob, Stock Nos. 11347, 11582 and 12700—Package of 5	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
12824	Switch—Radio-record switch (S6)	1.00
12555	Transformer—Phonograph input transformer (T2)	6.00
7217	Transformer—Step-down transformer for 220 volts, 50-60 cycle operation	17.40
12554	Volume Control—Phonograph volume control (R36)	1.52

The prices quoted above are subject to change without notice.

First Edition

IB-23339-3
(Supplement to IB-23339)

Cathode-Ray Oscillograph

Type TMV-122-C

25-60 CYCLE

The following sheets contain revised servicing information for the Cathode Ray Oscillograph, Type TMV-122-C. These sheets are to be used with Instruction Book IB-23339, replacing part of the servicing information included in that book.

The theory of operation, installation and operation are thoroughly covered in the instruction book. However, due to a slight circuit change, the operation of the "Range" switch is better described as follows (page 15):

7. "Range" switch, S4, selects one of eight timing capacitor values. It thus changes the timing axis oscillator frequency in steps giving 8 ranges approximately as follows:

   No. 1, 10-35; No. 2, 20-65; No. 3, 55-180; No. 4, 130-450; No. 5, 300-1050; No. 6, 900-3500; No. 7, 2000-7500, and No. 8, 5500-18,000 cycles.

Also under "6. Ampl. 'B' Gain Control (horizontal)" note the following:

Due to the capacity load on this input potentiometer, when operating on "Timing" at the higher audio frequencies, linear sweep will not be obtained at all settings of this control. For best results, the control should be set for maximum linearity, which will occur at about 2/3 full screen deflection.

Under "Replacement Parts," note the addition or changes in the items shown on page 5.

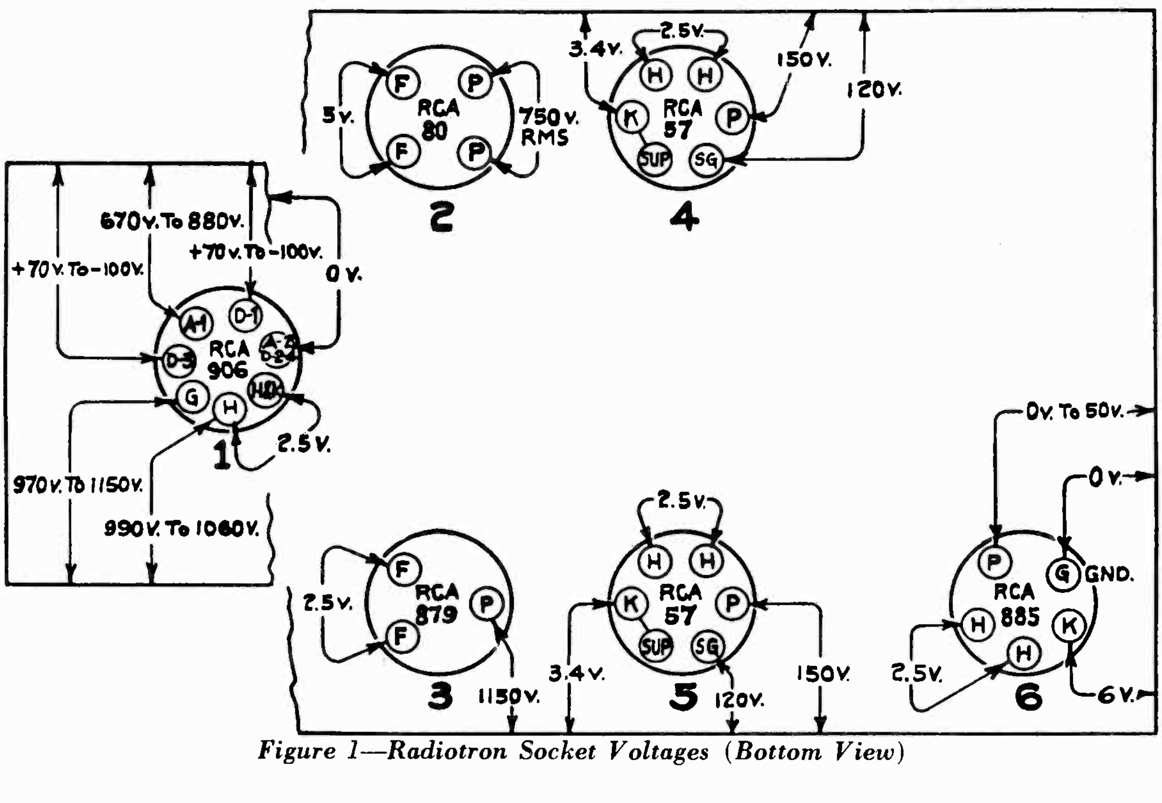


Figure 1—Radiotron Socket Voltages (Bottom View)

SN-566

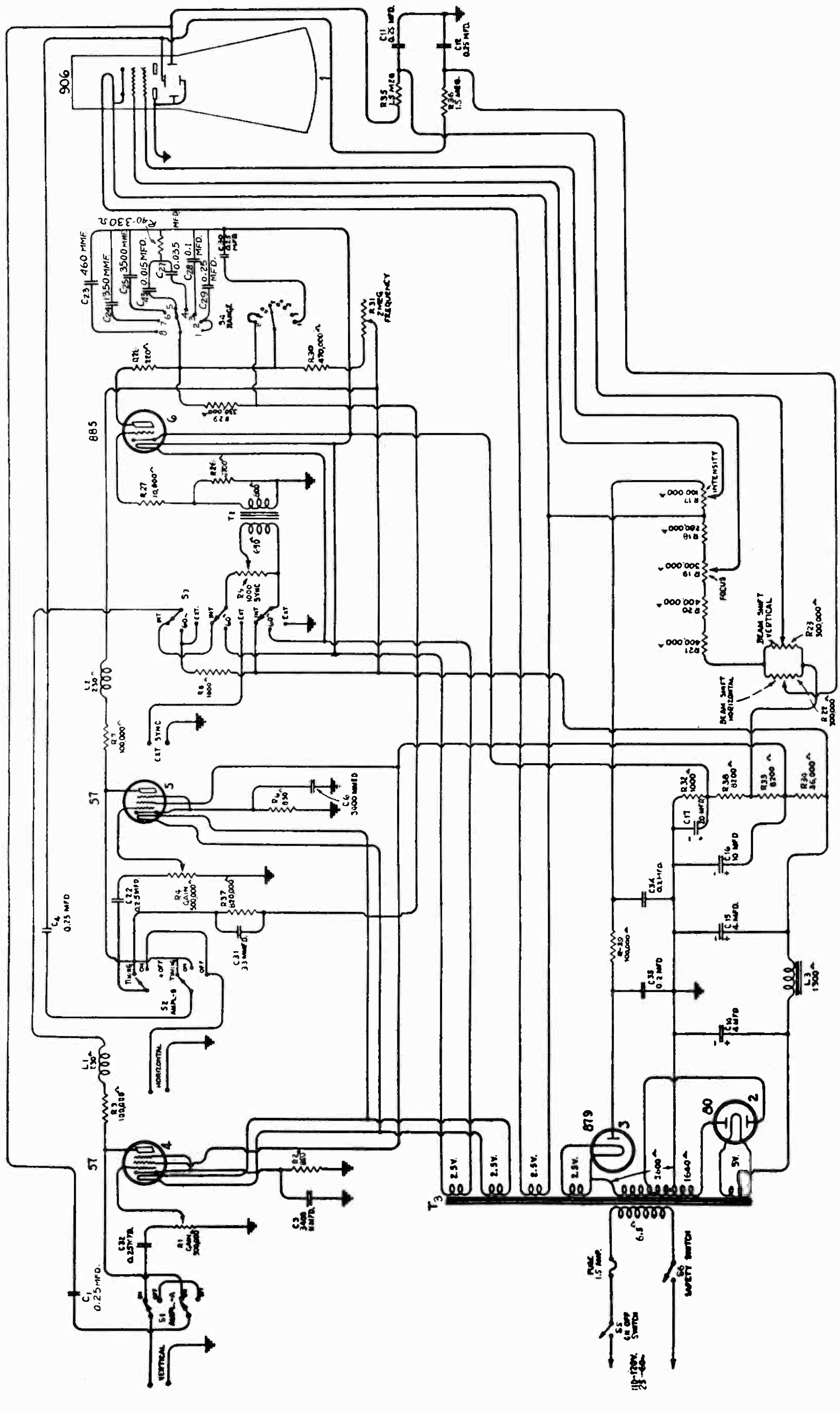


Figure 2—Schematic Diagram

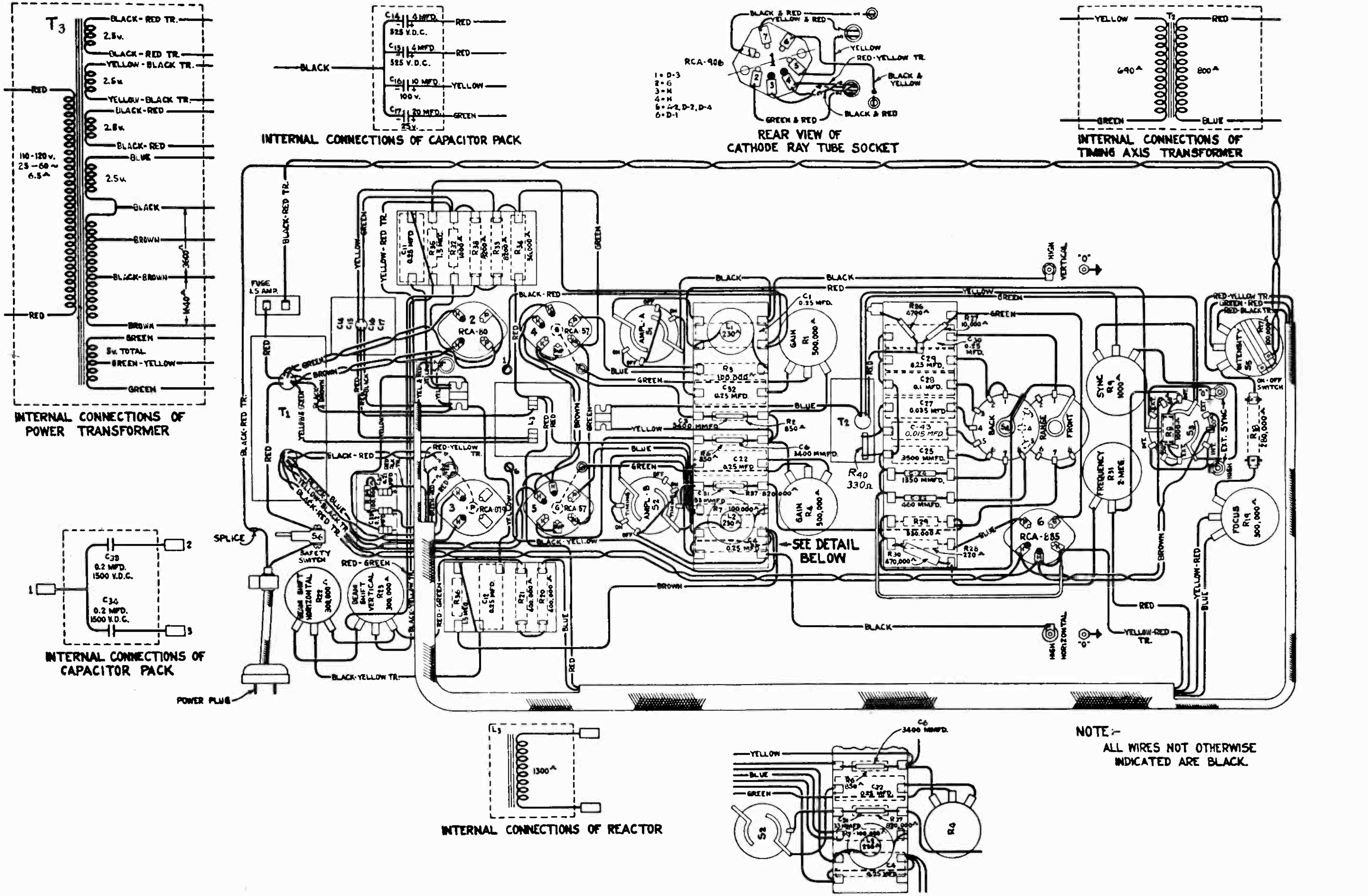


Figure 3—Wiring Diagram

SN-567

RADIOTRON SOCKET VOLTAGE TABLE

120-Volt, 60-Cycle Supply Line

RADIOTRON			Cathode Volts to Ground DC.	Screen Grid Volts To Ground DC.	Plate Volts to Ground DC.	Cathode Current MA-DC.	Anode Volts to Ground DC.		Deflecting Plates to Ground DC.		Filament or Heater Volts AC.
Socket Number	Type	Function					No. 1	No. 2	D_1	D_2	
1	RCA-906	Cathode Ray	−990 to −1060*	—	—	—	−670 to −880*	O	+70 to −100*	+70 to −100*	2.5
2	RCA-80	Low Voltage Rectifier	—	—	375 (RMS)	24	—	—	—	—	5.0
3	RCA-879	High Voltage Rectifier	—	—	+1150*	—	—	—	—	—	2.5
4	RCA-57	20–90,000 Cycle Amp.	+3.4	+120	+150	2.5	—	—	—	—	2.5
5	RCA-57	20–90,000 Cycle Amp.	+3.4	+120	+150	2.5	—	—	—	—	2.5
6	RCA-885	20–15,000 Cycle Osc.	+6.0	—	0 to +50*	180 to 900 Micro-Amps	—	—	—	—	2.5

* Cannot be correctly measured with ordinary voltmeter.

Stock No.	DESCRIPTION	List Price
4244	Cap—Contact cap—Package of 5....	$0.20
5198	Capacitor—33 mmfd. (C31).........	.16
5197	Capacitor—460 mmfd. (C23)........	.18
5115	Capacitor—1350 mmfd. (C24).......	.25
4439	Capacitor—3400 mmfd. (C3, C6)....	.35
5005	Capacitor—3500 mmfd. (C25).......	.16
11315	Capacitor—.015 mfd. (C43).........	.20
5196	Capacitor—0.035 mfd. (C27)........	.18
4841	Capacitor—0.1 mfd. (C28)..........	.22
4840	Capacitor—0.25 mfd. (C11, C12, C29, C30)	.30
5170	Capacitor—0.25 mfd. (C1, C4, C22, C32)	.25
4844	Capacitor Pack—Two sections of 0.2 mfd. each (C33, C34).............	7.25
7960	Knob—Range or Ext. Sync. switch knob	.20
5207	Potentiometer — Frequency control potentiometer (R31).............	1.35
5201	Resistor—220 ohms—Carbon type—½ watt (R28)—Package of 5.....	1.00
11932	Resistor—330 ohms—Carbon type—1/10 watt (R40)—Package of 5....	.75
12531	Resistor—910 ohms—Carbon type—½ watt (R2, R6)—Package of 5...	1.00
4687	Resistor—1000 ohms—Carbon type—½ watt (R8, R32)—Package of 10.	2.00
5199	Resistor—4700 ohms—Carbon type—¼ watt (R26)—Package of 5......	1.00
5205	Resistor—8200 ohms—Carbon type—1 watt (R33, R38)..............	.22
3381	Resistor—10,000 ohms—Carbon type ¼ watt (R27)—Package of 5.....	1.00
5206	Resistor—36,000 ohms—wire wound (R34)	.35
3252	Resistor—100,000 ohms—Carbon type —½ watt (R39)—Package of 5....	1.00
12529	Resistor—270,000 ohms—Carbon type —1 watt (R18)—Package of 5.....	1.10
5200	Resistor—330,000 ohms—Carbon type —½ watt (R29)—Package of 5....	1.00
12530	Resistor—390,000 ohms—Carbon type —1 watt (R20, R21)—Package of 5.	1.10
5202	Resistor—470,000 ohms—Carbon type —½ watt (R30)—Package of 5....	1.00
5203	Resistor—820,000 ohms—Carbon type —½ watt (R37)—Package of 5....	1.00
5204	Resistor—1.5 megohm—Carbon type —½ watt (R35, R36)—Package of 5	1.00
11896	Transformer—Power transformer — 105-125 volts—25-60 cycles........	12.55

IB-23339-4
(Supplement to IB-23339)

Cathode-Ray Oscillograph

Type TMV-122-D
EXTENDED RANGE

The following sheets contain revised servicing information for the Cathode Ray Oscillograph, Type TMY-122-D. These sheets are to be used with Instruction Book IB-23339, replacing part of the servicing information included in that book.

The timing axis oscillator range extends down to approximately four cycles per second and the low-frequency response of the horizontal and vertical amplifiers is better than that of the TMV-122-B. Two dual tip jacks are provided to allow the use of d.c. deflecting voltages when desired. The dual jack on the right (S8) is used for horizontal deflection, the one on the left (S9) for vertical. In both cases the lower jack is connected to the ungrounded deflecting plate of the RCA-906 tube. The beam shift controls are still operative for shifting the spot position. Care should be taken if any connection is made to the oscillograph chassis, as a d.c. voltage may exist between the pin jacks and chassis, depending upon the settings of the beam shift controls.

The theory of operation, installation and operation are thoroughly covered in the instruction book. However, due to a slight circuit change, the operation of the "Range" switch is better described as follows (page 15):

7. "Range" switch, S4, selects one of eight timing capacitor values. It thus changes the timing axis oscillator frequency in steps giving 8 ranges approximately as follows: No. 1, 4-14; No. 2, 12-46; No. 3, 40-160; No. 4, 130-450; No. 5, 300-1050; No. 6, 900-3500; No. 7, 2000-7500; No. 8, 5500-18,000 cycles.

Also under "6. Ampl. 'B' Gain Control (horizontal)" note the following:

Due to the capacity load on this input potentiometer, when operating on "Timing" at the higher audio frequencies, linear sweep will not be obtained at all settings of this control. For best results, the control should be set for maximum linearity, which will occur at about 2/3 full screen deflection.

Under "Replacement Parts," note the addition or changes in the items shown on page 5.

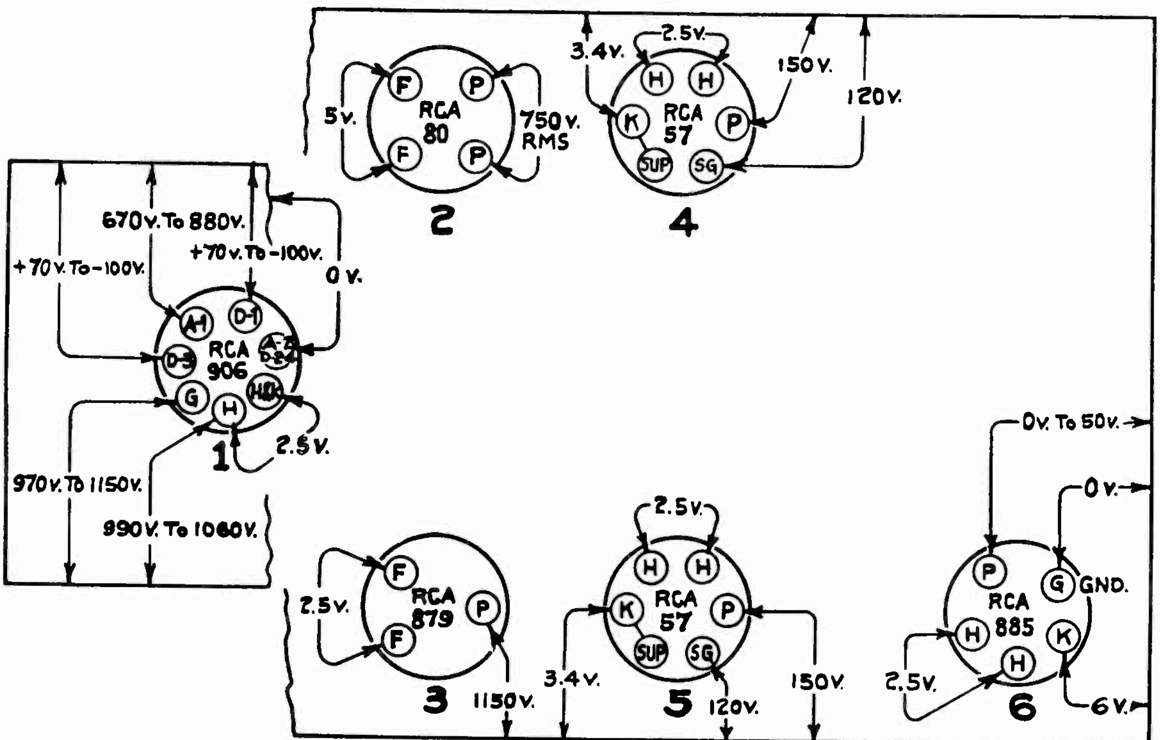


Figure 1—Radiotron Socket Voltages (Bottom View)

RADIOTRON SOCKET VOLTAGE TABLE

120-Volt, 60-Cycle Supply Line

RADIOTRON			Cathode Volts to Ground DC.	Screen Grid Volts To Ground DC.	Plate Volts to Ground DC.	Cathode Current MA-DC.	Anode Volts to Ground DC.		Deflecting Plates to Ground DC.		Filament or Heater Volts AC.
Socket Number	Type	Function					No. 1	No. 2	D_1	D_2	
1	RCA-906	Cathode Ray	−990 to −1060*	—	—	—	−670 to −880*	0	+70 to −100*	+70 to −100*	2.5
2	RCA-80	Low Voltage Rectifier	—	—	375 (RMS)	24	—	—	—	—	5.0
3	RCA-879	High Voltage Rectifier	—	—	+1150*	—	—	—	—	—	2.5
4	RCA-57	20–90,000 Cycle Amp.	+3.4	+120	+150	2.5	—	—	—	—	2.5
5	RCA-57	20–90,000 Cycle Amp.	+3.4	+120	+150	2.5	—	—	—	—	2.5
6	RCA-885	20–15,000 Cycle Osc.	+6.0	—	0 to +50*	180 to 900 Micro-Amps	—	—	—	—	2.5

* Cannot be correctly measured with ordinary voltmeter.

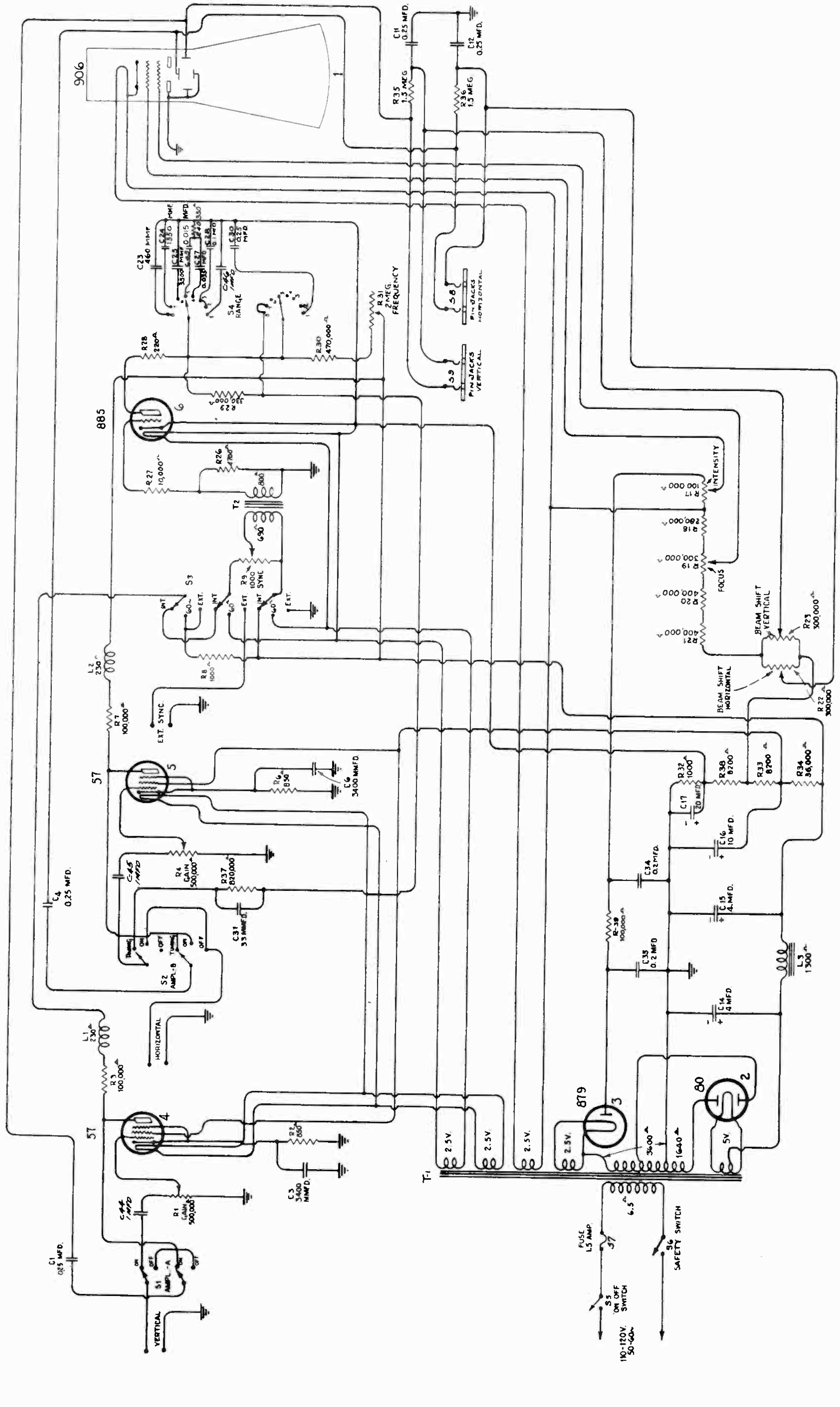


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Figure 2—Schematic Diagram

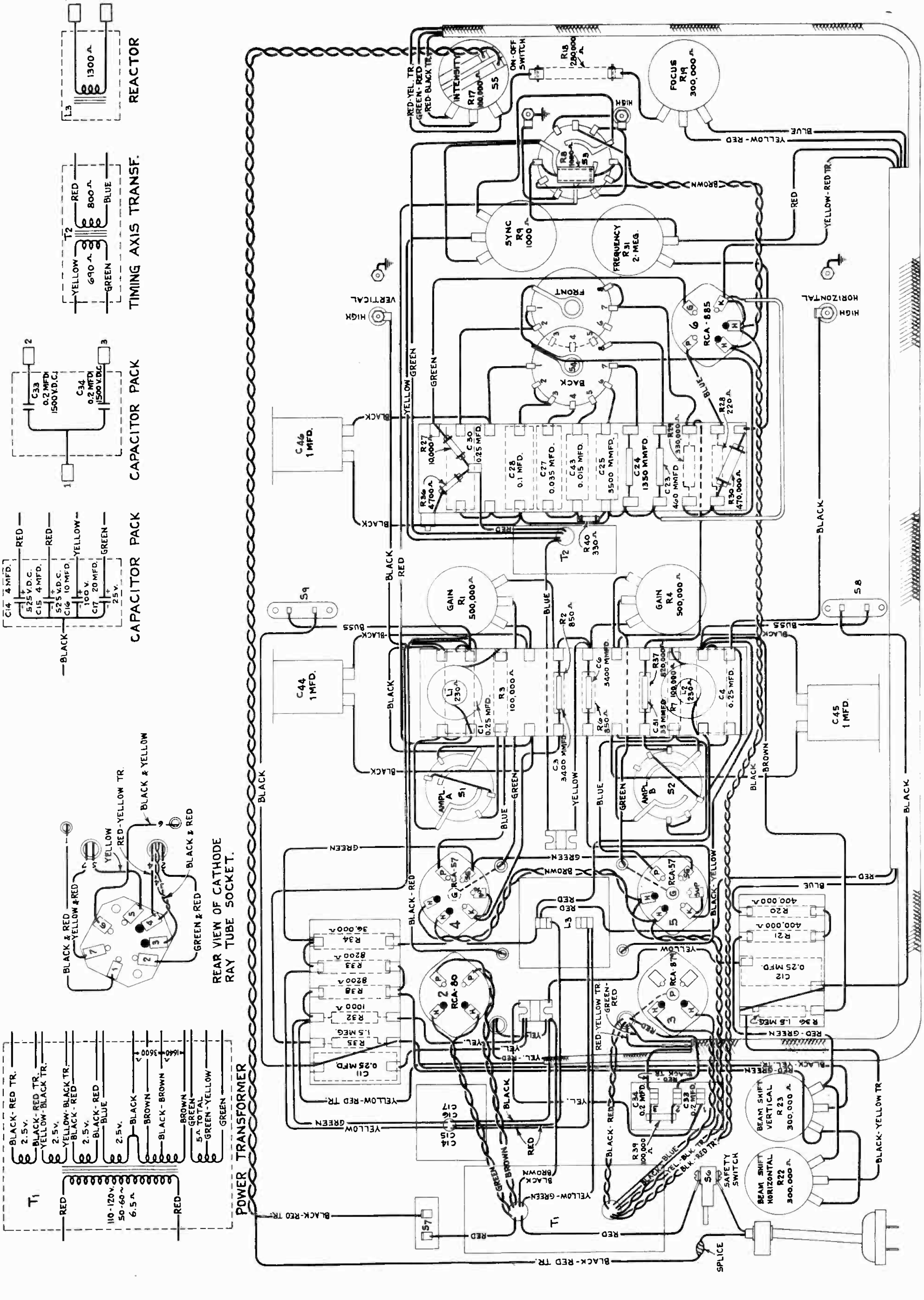


Figure 3—Wiring Diagram

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
4244	Cap—Contact cap—Package of 5	$0.20	4687	Resistor—1000 ohms—Carbon type—½ watt (R8, R32)—Package of 10	2.00
5198	Capacitor—33 mmfd. (C31)	.16	5199	Resistor—4700 ohms—Carbon type—¼ watt (R26)—Package of 5	1.00
5197	Capacitor—460 mmfd. (C23)	.18	5205	Resistor—8200 ohms—Carbon type—1 watt (R33, R38)	.22
5115	Capacitor—1350 mmfd. (C24)	.25	3381	Resistor—10,000 ohms—Carbon type ¼ watt (R27)—Package of 5	1.00
4439	Capacitor—3400 mmfd. (C3, C6)	.35	5206	Resistor—36,000 ohms—wire wound (R34)	.35
5005	Capacitor—3500 mmfd. (C25)	.16	3252	Resistor—100,000 ohms—Carbon type—½ watt (R39)—Package of 5	1.00
11315	Capacitor—.015 mfd. (C43)	.20	12529	Resistor—270,000 ohms—Carbon type—1 watt (R18)—Package of 5	1.10
5196	Capacitor—0.035 mfd. (C27)	.18	5200	Resistor—330,000 ohms—Carbon type—½ watt (R29)—Package of 5	1.00
4841	Capacitor—0.1 mfd. (C28)	.22	12530	Resistor—390,000 ohms—Carbon type—1 watt (R20, R21)—Package of 5	1.10
4840	Capacitor—0.25 mfd. (C11, C12, C30)	.30	5202	Resistor—470,000 ohms—Carbon type—½ watt (R30)—Package of 5	1.00
5170	Capacitor—0.25 mfd. (C1, C4)	.25	5203	Resistor—820,000 ohms—Carbon type—½ watt (R37)—Package of 5	1.00
11897	Capacitor—1.0 mfd. (C44, C45, C46)	3.70	5204	Resistor—1.5 megohm—Carbon type—½ watt (R35, R36)—Package of 5	1.00
4844	Capacitor Pack—Two sections of 0.2 mfd. each (C33, C34)	7.25			
11898	Jack—Dual tip pin jack	.22			
7960	Knob—Range or Ext. Sync. switch knob	.20			
11899	Plug—Pin tip plug for jack, Stock No. 11898—Package of 4	.46			
5207	Potentiometer—Frequency control potentiometer (R31)	1.35			
5201	Resistor—220 ohms—Carbon type—½ watt (R28)—Package of 5	1.00			
11932	Resistor—330 ohms—Carbon type—1/10 watt (R40)—Package of 5	.75			
12531	Resistor—910 ohms—Carbon type—½ watt (R2, R6)—Package of 5	1.00			

STOCK No. 9641

IB-23339-4

RCA PARTS DIVISION

RCA MANUFACTURING CO., INC.

CAMDEN, NEW JERSEY, U. S. A.

BEAT FREQUENCY OSCILLATOR

TYPE TMV-134-A

INTRODUCTION

These instructions cover description, operation, maintenance, and servicing of the Type TMV-134-A Beat Frequency Oscillator; a portable, self-contained instrument for generating audio frequencies from 30 to 15,000 cycles. In general, this instrument may be used wherever it is desired to obtain audio frequencies between the ranges given above and is applicable for measuring the fidelity of radio receivers, the frequency response of audio amplifiers, transformer characteristics, filter characteristics, the frequency characteristics of amateur transmitters, frequency measurements, speed measurements, hearing tests, etc. It operates entirely from an a-c source of 110-120 volts, 50-60 cycles. The Radiotrons used, and the type circuits in which each is employed are thoroughly described in the section entitled "Circuit description."

Another important feature is the output transformer which provides for perfect load matching between the oscillator output and the most frequently encountered impedances; namely, 5,000 ohms, 500 ohms, and 250 ohms. This transformer is also center-tapped for proper operation on balanced-to-ground lines. The output signal is continuously controllable.

A very accurate means of checking the oscillator frequency against the power-supply frequency, for calibration purposes, is provided by means of a neon lamp. At multiple or sub-multiple frequencies of the power-supply frequency, it is possible to check the oscillator frequency to better than one part in a hundred. This neon lamp acts as a pilot lamp when not used for calibrating purposes, indicating whether or not power is being applied to the instrument.

Figure 1—Beat Frequency Oscillator

A number of applications and methods of use of this Beat Frequency Oscillator are outlined under the section entitled "Applications."

OPERATION

Insert the power cord into a convenient power-supply outlet of 110-120 volts, 50-60 cycles. Turn the 110-volt a-c switch "On" and turn the indicator switch "On." The neon lamp should glow, indicating that power is applied to the instrument. After approximately one minute, the tubes will be heated and the oscillator will be in operating condition. For best stability, as with any equipment of this nature, it is advisable to allow the component parts of the unit to reach a steady operating temperature. The time will vary with the ambient temperature of the room and may require from one-quarter to one-half hour. Turn the indicator switch to "Cal." and advance the output control to its maximum clockwise position. Set the main frequency control to the frequency of the power supply (60 cycles for 60-cycle supply or 50 cycles for 50-cycle supply). Rotate the "Cal. Adj." knob back and forth and stop at the point where the neon lamp goes out entirely. **This setting is used as a reference position only.** Now, slowly move the "Cal. Adj." knob in a clockwise direction from this reference position. The neon lamp will flicker slowly at first, then speed up, and then slow down to a very few brilliant flashes per second with both neon lamp plates flashing on and off together. This setting should be made so as to obtain the longest time between flashes, thus indicating zero beat and proper calibration. The movement of the "Cal. Adj." knob (at the outer rim) to obtain this condition will be approximately 1/16-inch clockwise from the reference position.

To check this calibration, advance the main control to a frequency setting twice that of the power-supply frequency. The neon lamp will glow steadily and by moving the main frequency control slightly above or slightly below this setting, the plates of the neon lamp will flash alternately one plate and then the other plate. These flashes will not be as bright as for the calibration position. The output control should be reduced for this check.

When using the TMV-122-B Cathode-Ray Oscillograph, connect the 5,000-ohm terminals of the TMV-134-A to the vertical input terminals on the oscillograph and set the oscillograph synchronizing switch to its 60-cycle (center) position. Set the main frequency control of the TMV-134-A to the frequency of the power supply and rotate the "Cal. Adj." knob back and forth and stop at the point where the oscillograph image appears as a straight horizontal line. **This is the reference position only.** Now, advance the "Cal. Adj." knob clockwise until a single sine wave appears on the oscillograph screen. To check, advance the main frequency control to a setting of twice the power-supply frequency. At this setting, two sine waves should appear on the screen.

CAUTION. It is possible to obtain an indication of correct calibration when the "Cal. Adj." knob is turned in a counter-clockwise direction from the reference point. This will be detected in a check at twice the power-supply frequency as the neon lamp will go out entirely, or, if the cathode-ray oscillograph is used, the image will appear as a horizontal line.

A pair of headphones connected across the 5,000-ohm terminals may be used to listen to the signal when becoming familiar with calibration. When correctly calibrated, the frequency should increase when the main frequency control is turned clockwise from its 30-cycle mark. **When incorrectly calibrated, the frequency will decrease when this control is rotated from its 30-cycle mark to a dial reading of twice the frequency of the power supply, then increases beyond that point. The latter is to be avoided.** With a little practice the correct calibration point will be readily distinguished. After calibration, the indicator switch should be turned to its "On" position. The instrument is then ready for operation.

When connecting the output terminals to the device being tested, connect the 250-, 500-, or 5,000-ohm terminals to a load which has an impedance comparable to 250, 500, or 5,000 ohms respectively. It is preferable to have the load impedance equal to that of the terminals to which it is connected; however, if an exact match cannot be obtained, select the terminals which have the next lower impedance than that of the load.

The output transformer has a center-tap for feeding lines or circuits which are balanced to ground. This center-tap is not grounded to the case (chassis) of the TMV-134-A. If hum is encountered, it is advisable to try various grounding combinations from the TMV-134-A case, or center-tap, or both, to the ground of the instrument under test. If one side of the input of the equipment being tested is grounded, do not ground the center-tap of the output transformer unless it is used as the terminal to the grounded side. For balanced input lines where the center-tap of the equipment under test is grounded, best results will normally be obtained by connecting the center-tap of the output transformer to the same point of ground as the center-tap of the instrument under test. Shielded and twisted leads will normally be advantageous when protection against hum pickup is necessary, or, when running the leads a considerable distance from the TMV-134-A.

APPLICATIONS

Several general applications to which this Beat Frequency Oscillator can be applied are outlined below. Figures 2 to 6 show methods of connection and means of measurement for these applications. The two meters used for audio-frequency measurements may be vacuum-tube voltmeters or rectifier a-c meters capable of measuring high audio frequencies. The same type meters should be used in each position for greatest accuracy.

Fidelity Characteristics of Radio Receivers

An over-all electrical fidelity characteristic of a radio receiver consists of applying a modulated r-f signal into the antenna stage and measuring the audio output voltage (at various modulating frequencies) across the loudspeaker voice coil.

Connect the 250-ohm output terminals of the TMV-134-A to a test oscillator capable of being externally modulated. The RCA TMV-97-C Test Oscillator has a jack provided for this purpose. Connect the output terminals of the test oscillator to the antenna and ground terminals of the receiver under test. Turn the receiver volume control to its minimum position. Connect a suitable a-f voltmeter across the 250-ohm terminals of the TMV-134-A and another similar meter across the loudspeaker voice coil. The arrangement is shown by figure 2. Set the test oscillator to 1,000 kc and adjust its output to deliver approximately 2 millivolts into the receiver antenna stage. This output will be obtained from the TMV-97-C test oscillator with its Hi-Lo switch set to "Lo" and its output control set to maximum. Adjust the frequency of the TMV-134-A to a frequency between 3,500 and 5,000 cycles to give best indication on the meter as explained below, and adjust its output to 5.4 volts. Tune the radio receiver to the 1,000-kc signal and advance its volume control until the meter across the voice coil shows an observable indication. Tune the receiver back and forth through the signal, noting that two peaks will be observed on the meter. These peaks indicate the side-band response. The receiver should then be carefully tuned to the lowest meter reading between the peaks. The receiver is then precisely tuned to the test oscillator frequency. Now, shift the TMV-134-A frequency to 400 cycles and adjust its output to 5.4 volts. Adjust the receiver volume control until the power delivered to the loudspeaker voice coil is 0.1 watt. Knowing the voice coil

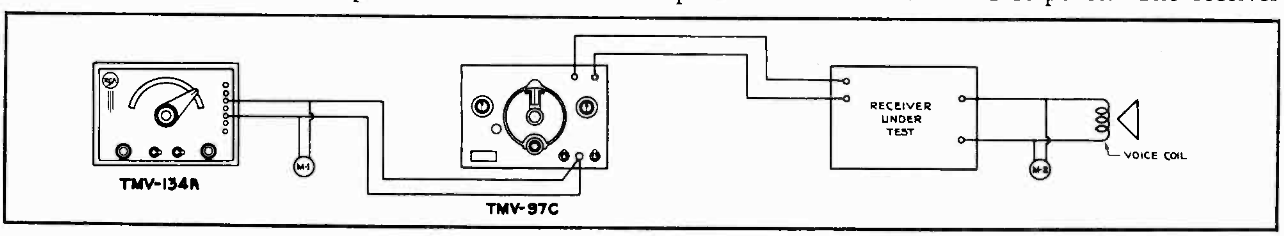


Figure 2—Receiver Fidelity Measurements

impedance, the voltage required across the voice coil to obtain this power may be calculated by use of the formula:

$$E \text{ (volts)} = \sqrt{W \times Z_{VC}}$$

Where W is the desired output in watts and Z_{VC} is the impedance of the voice coil in ohms.
Example: The desired output is 0.1 watt and the voice coil impedance is 3 ohms, the voltage is

$$E = \sqrt{0.1 \times 3} = \sqrt{0.3} = 0.55$$

By rearranging this formula, the power in watts delivered to the voice coil may be calculated by

$$W \text{ (watts)} = \frac{(E)^2}{Z_{VC}}$$

using the same values as above

$$W = \frac{(0.55)^2}{3} = \frac{0.3}{3} = 0.1$$

After setting the volume control to obtain the specified output at 400 cycles, vary the frequency of the TMV-134-A through the desired audio range, keeping its output at 5.4 volts (this gives approximately 30% modulation of the TMV-97-C) and record the variations of the voltage across the loudspeaker voice coil.

Audio Amplifier Frequency Response

In general, audio amplifier frequency response is taken the same way as the fidelity of a radio receiver except that no test oscillator is used. Figure 3 shows the general arrangement. The output of the TMV-134-A may be fed directly into the input of the audio amplifier, or, when the input voltage required for the amplifier is so low that it is practically impossible to measure it with an ordinary voltmeter, an attenuator should be used. This will provide a definite ratio between the output voltage of the TMV-134-A and the input voltage fed to the amplifier.

Normally, either of two types of attenuators may be used and each type has its particular advantage. If one side of the amplifier input is grounded, the arrangement shown at the left may be used. The value of $R_1 + R_2$ should be equal to or greater than the impedance of the terminals of the TMV-134-A to which they are connected (i.e., 250 ohms total for 250-ohm taps, 500 ohms total for 500-ohm taps, or 5,000 ohms total for 5,000-ohm taps). The ratio of R_2 to the total resistance $R_1 + R_2$ will determine the voltage E_2 which is applied to the amplifier when the output voltage E_1 of the TMV-134-A is known. R_2 should always be less than one-twentieth of the input impedance of the amplifier. Example: Assume the input voltage E_2 to an audio amplifier for rated output is 0.1 volt. Using the 5,000-ohm terminals of the TMV-134-A, $R_1 + R_2$ should be 5,000 ohms. A convenient value to adjust the TMV-134-A output for these terminals is 10 volts. The voltage ratio between the output of the TMV-134-A and the input of the amplifier will then be 100 to 1. R_2 should then be $\frac{1}{100}$ of $R_1 + R_2$ or 50 ohms. R_1 should be 5,000 − 50 or 4,950 ohms. This example is given as a guide for calculating the values of resistance needed. Any combination of resistance values may be worked out to give the required input voltage.

The voltage gain of an amplifier is the ratio of the output voltage to the input voltage. Using the attenuator and reading the two meters in the circuits of figure 3, knowing the values of R_1 and R_2, the

$$\text{Gain} = \frac{E_3 (R_1 + R_2)}{R_2 \times E_1}$$

(This formula with R_6 or R_3 omitted.)

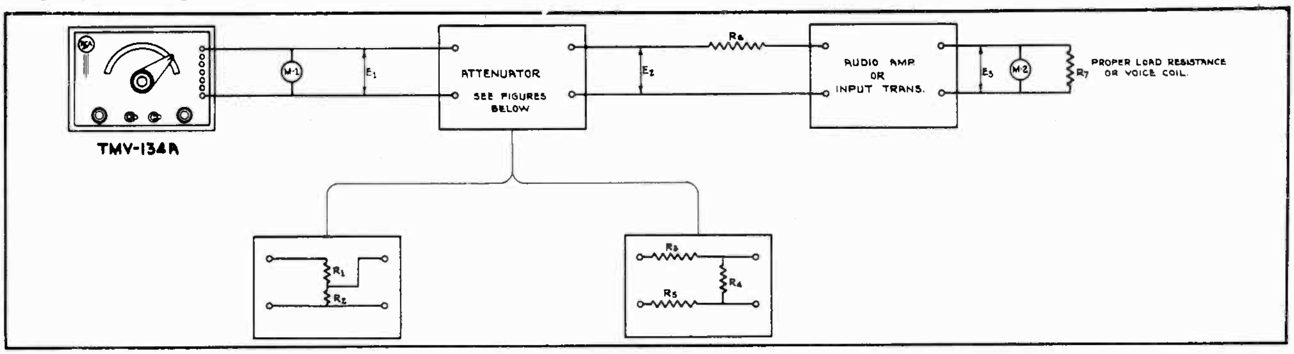


Figure 3—Audio Amplifier Frequency Response

Assume E_3 to be 5 volts and using the constants in the above example

$$\text{Gain} = \frac{5\,(4{,}950 + 50)}{50 \times 10} = \frac{5 \times 5{,}000}{500} = 50$$

When the input circuit to the amplifier is balanced-to-ground, the attenuator shown at the right should be used. The values of R_3 and R_5 should be equal, and for the calculations above, $R_3 + R_5$ should be equal to R_1 so that the ratio of R_4 to the total resistance $R_3 + R_4 + R_5$ is the same as the ratio of R_2 to the total resistance $R_1 + R_2$.

The value of the resistance feeding the input of the amplifier (R_2 shown at left or R_4 shown at right) should always be less than one-twentieth the value of the input impedance of the amplifier. The amplifier input may consist of a transformer, resistor, or tube load.

When an input transformer is incorporated in the amplifier, a resistor R_6, equal to the input impedance of the amplifier, should be placed in series with the amplifier input to provide proper impedance matching. The output of the audio amplifier should be connected to the speaker voice coil or an equivalent load resistor R_7. The decrease in the output load impedance caused by the meter should be taken into consideration for best accuracy.

Audio Transformers and Filter Characteristics

The above arrangement for audio amplifiers will apply to input transformers. The value of R_6 should be equal to the input impedance of the transformer, and the load on the secondary should be equal to the load into which it works. Where it connects directly to a tube, a vacuum-tube voltmeter will approximate the tube load and will be the only loading required.

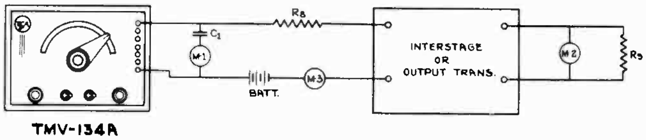


Figure 4—Audio Transformer Characteristics

Normally, the step-up ratio is high and an attenuator should be used. Calculations for gain will be the same as for amplifiers.

For audio interstage and output transformers (except push-pull) it may be necessary to pass current through the primary winding. The battery voltage should be such that the current is equivalent to the normal current under operating conditions. Figure 4 shows the arrangement. This current is measured by a d-c milliammeter M-3 inserted in series with the primary. Resistor R_8 should be equal to the plate impedance of the tube from which the transformer works, and R_9 should be equivalent to the secondary loading—normally the capacity between tube elements—and a vacuum-tube voltmeter will approximate this load. Likewise, if R_9 is high, a vacuum-tube voltmeter should be used. Any special loading on either the primary or secondary should be duplicated if the performance in a particular circuit is to be measured. A capacitor C_1 should be connected in series with the meter M-1 to block out the d-c which would otherwise give false readings. The battery polarity should be such as to give the highest reading on M-1 at 60 cycles. For interstage transformers, the 250-ohm terminals on the TMV-134-A should be used; for output transformers the 5,000-ohm terminals should be used.

For filters, R_8 and R_9 should be equal to the characteristic impedance of the input and output circuits of the filter, or the impedance from which the filter works and works into. Where R_9 is high, M-2 should be a vacuum-tube voltmeter. For lower impedance values, M-2 + R_9 in parallel must be equal to the output impedance of the filter.

For transformers having push-pull primaries, R_8 should be equal to the sum of the plate resistances of the tubes from which the transformer works and the total primary connected to the circuit. When the transformer has a push-pull secondary, the voltmeter and load should be connected across the total winding.

For output transformers (not push-pull) R_9 should be equal to the voice coil impedance of the speaker for which it was designed.

Amateur Transmitter Over-all Frequency Characteristics

When taking over-all frequency characteristics of an amateur transmitter, some type of modulation indicator is necessary. The most convenient device for this use is a Cathode-Ray Oscillograph such as the Type TMV-122-B. Connect the TMV-134-A to the transmitter microphone transformer (one 5,000-ohm terminal to high side, and center-tap to transmitter ground) as indicated in figure 5; also, connect the TMV-134-A to the "Ext. Sync." terminals of the Cathode-Ray Oscillograph. Place a pickup coil near the output of the power amplifier stage of the transmitter and connect it to the vertical input of the Cathode-Ray Oscillograph.

The audio voltage from the TMV-134-A should then be held constant to give the desired percentage modulation at a given audio frequency, normally 1,000 cycles. The sweep-frequency oscillator in the oscillograph should be adjusted to give approximately three patterns on the screen. Data is then taken for variation in percentage modulation with variation in audio frequency. Measuring the percentage modulation is fully covered in the instructions on the TMV-122-B Oscillograph.

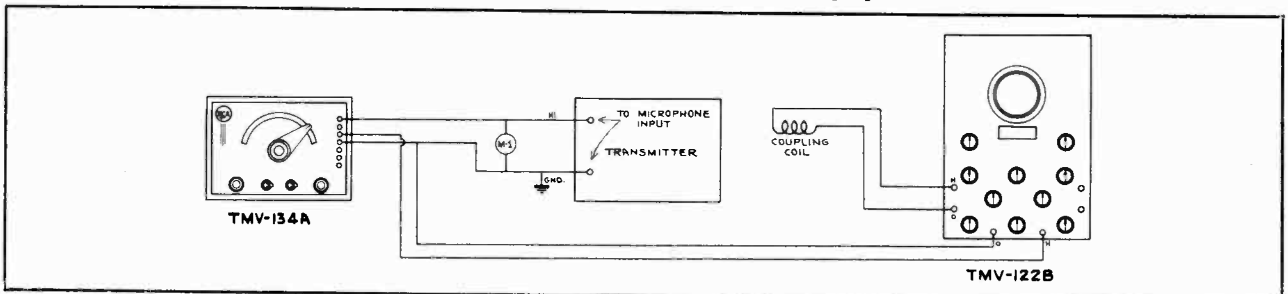


Figure 5—Amateur Transmitter Frequency Characteristics

Frequency Measurements

Frequencies from a few cycles per second up to 150 kilocycles per second may be measured with this instrument in conjunction with the TMV-122-B Cathode-Ray Oscillograph. This information is completely explained in the instruction book for the TMV-122-B.

Stroboscopic Speed Measurements

The speed of rotating shafts, motors, etc., may be readily measured with this instrument. Figure 6 shows the arrangement. A disc, made up in equally divided black and white spaces, should be placed on the rotating member. The number of sections varies inversely with the speed.

The number of black spaces can be readily chosen by trial in the formula

$$RPM = \frac{60 \times f}{N}$$

where 60 = seconds per minute,
f = frequency in cycle per second,
N = number of black sections.

Example: N = 4 sections, f = 100 c.p.s.

$$RPM = \frac{60 \times 100}{4} = 1{,}500$$

The additional equipment required for these measurements is a battery of about 45 volts and a ¼-watt neon lamp. The neon lamp should be held close to the disc and the frequency of the oscillator varied until the segments appear motionless and of the same width as the original size of the segments.

In some cases, more than 45 volts may be used This can best be determined by turning the TMV-134-A output control to its minimum position and

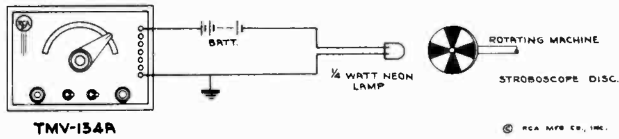


Figure 6—Stroboscopic Speed Measurements

connecting enough battery so that the neon lamp just lights. Then reduce this battery potential by approximately 10 volts and the desired results are obtained.

When the rotating members are wheels, with spokes or gears, this can be done directly if the teeth or spokes are painted white. Then the number of spokes or teeth is N in the formula.

SERVICE DATA

Electrical Specifications

Power-Supply Rating:	
Voltage	110-120 A.C.
Frequency	50-60 Cycles
Power Consumption	15 Watts
Fuse Protection	½ Ampere
Range and Applications:	
Frequency	30-15,000 Cycles
Output:	
With Open Circuit	25 Volts
At 5,000-Ohm Load	18 Volts
At 500-Ohm Load	6 Volts
At 250-Ohm Load	4 Volts
Power Output	60 Milliwatts
Radiotrons Used, and Functions:	
1 RCA-954	Fixed R-F Oscillator
1 RCA-954	Variable R-F Oscillator
1 RCA-955	Detector
1 RCA-955	Audio Amplifier
1 RCA-84	Full-Wave Rectifier

Mechanical Specifications

Over-all Dimensions:	
Height	6½ inches
Width	9¾ inches
Depth	4½ inches
Weights:	
Net	10¾ pounds
Shipping	13 pounds

Circuit Description

The RCA TMV-134-A Beat Frequency Oscillator consists of two radio-frequency oscillators whose outputs are combined in a detector to produce the desired audio beat-note or difference frequency which is amplified and fed to the output transformer. Referring to the schematic circuit diagram (figure 7) the following action takes place.

A fixed r-f oscillator stage, consisting of a self-

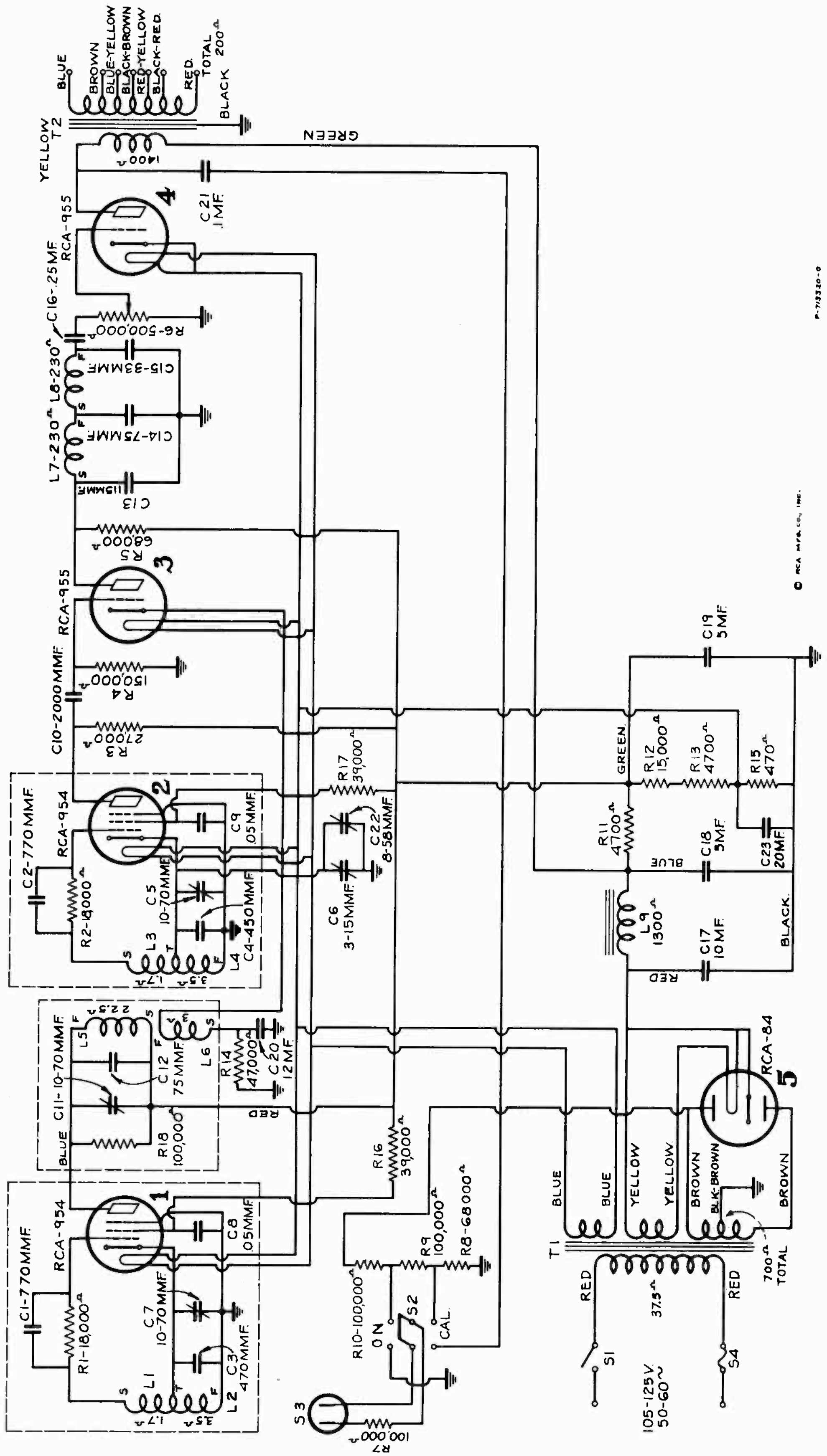


Figure 7—Schematic Circuit Diagram

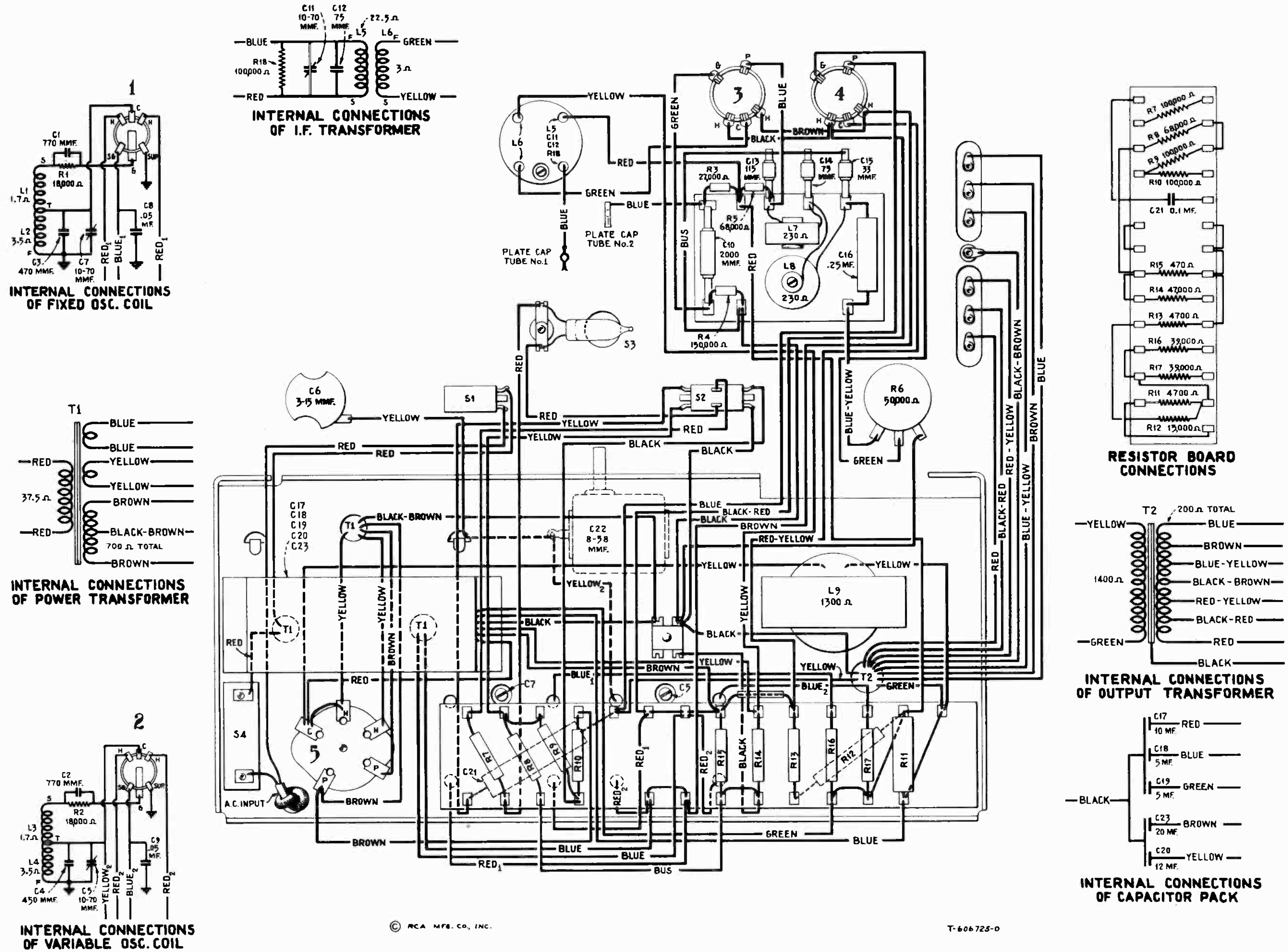


Figure 8—Chassis Wiring Diagram

biased RCA-954 acorn-type pentode Radiotron and its associated capacity and inductance, oscillates at a frequency of 350 kc; the second grid of this tube operates as the oscillator plate. The plate (termed "work plate") is electron coupled to the oscillation-generating portion of the tube and feeds into the primary of the i-f transformer. The secondary of this i-f transformer is connected in series with the cathode of the self-biased RCA-955 acorn-type detector tube which provides detector-cathode modulation at the frequency of the fixed oscillator.

The variable r-f oscillator stage consists of a similar circuit to that of the fixed oscillator except that the main frequency control C-22 is connected across L-4 and provides the required variable capacity to change the frequency from 30 to 15,000 cycles below that of the fixed oscillator. The electron-coupled work plate is resistance-capacitance coupled to the grid of the RCA-955 detector tube. This provides detector-grid modulation at the frequency of the variable oscillator.

The method of electron coupling of each oscillator circuit provides good stability and effectually prevents external circuit effects reflecting to the oscillator circuits, which would otherwise have a tendency to cause frequency drift, instability, and non-uniform output.

The two r-f oscillator signals, one entering the cathode circuit and one entering the grid circuit, are detected by the RCA-955 Radiotron. The output of this stage is fed to the control grid of the RCA-955 fixed-bias amplifier through a two-stage r-f filter. This filter allows only the detected audio voltage to be applied to the amplifier grid. The output control R-6 is connected in the grid circuit of the amplifier stage and allows continuous control of the output voltage. The output of the amplifier stage is then fed into a statically shielded output transformer. This transformer is designed to work into loads of 250, 500, or 5,000 ohms. A center-tap is provided so that lines or circuits of these impedances may be balanced to ground.

The power supply consists of an RCA-84 full-wave rectifier working into a condenser input-filter circuit. The output of the filter circuit supplies the d-c voltages required for the various circuits of the apparatus.

A neon lamp is used either as a pilot lamp or as a calibration indicator depending on the position of the indicator switch. In the "calibration" position a portion of the a-c voltage from the high-voltage winding of the power transformer is impressed on one plate of the neon lamp from the junction of resistors R-8 and R-9 through a 100,000-ohm resistor R-7. The other plate of the neon lamp is connected through C-21 to the output of the RCA-955 amplifier. Proper calibration is indicated when the two frequencies applied to the neon lamp are the same. The lamp will then stay lit continuously or stay out continuously depending on the phase relation of the applied voltages. When the frequencies are nearly the same, both plates of the lamp will flash together at the difference frequency. In the "on" position, the neon lamp is connected from the junction of resistors R-9 and R-10 to ground and acts as a pilot lamp. A small air condenser C-6 is connected in parallel with the main frequency control to change the frequency of the variable oscillator for setting the calibration point.

Maintenance

The various diagrams given in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, and inductances are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, and C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. These identifications are in a sequence which begins at the left of the diagram and increases numerically from left to right, thus facilitating the location of such parts on the schematic diagram.

The coils, reactors, and transformer windings are rated in terms of their d-c resistance. This method of rating provides ready means for checking continuity of circuits. Suspected faulty circuits or parts may be checked and their resistances compared with the value given on the schematic diagram.

Failure of operation may result from:

(1) Power supply being "off."
(2) Open fuse within the instrument.
(3) Defective tubes.
(4) Defects within the instrument itself.

Low output or improper calibration may result from:

(1) Improper alignment of the various circuits.
(2) Oscillator coil shields loose or removed.
(3) Defective tubes.
(4) Improper setting of control knobs on shafts.
(5) Defects within the instrument itself.

CAUTION.—Disconnect power supply before removing case.

Care in removing the case will prevent damage to the internal parts, especially the acorn-type Radiotrons. After the four screws around the front panel are removed, the panel should be tilted forward and the case carefully slipped off. **DO NOT PLACE THE INSTRUMENT IN SUCH A POSITION AS TO REST ON OR DAMAGE THE ACORN TUBE TOP (PLATE) CONTACTS.**

Alignment Procedure

Correct alignment of both oscillator circuits is necessary for proper frequency calibration, and correct adjustment of the i-f transformer primary trimmer is essential for proper output. All of these circuits should be properly adjusted every six months or immediately after any repairs or replacements have been made which affect the oscillator circuits. If either or both of the RCA-954 oscillator tubes have been interchanged or replaced, these circuits should also be aligned, since correct alignment depends on the tube characteristics. Adherence to these points will assure continued accuracy of calibration and output. Proceed as follows:

Remove the instrument from its case and place it on one side so that all trimmer adjustments are accessible. Make sure that the two oscillator shields are securely screwed in place and that all tubes are in secure contact with their socket terminals. Make sure that both oscillator plate leads are making good contact with the top connections on these tubes. Reset the control knobs, as explained in section below, if necessary.

Fixed Oscillator Alignment

Place the instrument in operation with both the power and indicator switches to their "On" positions, the output control to its maximum (clockwise) position, and the main control to its 15,000-cycle position. Tune in a radio receiver accurately to 700 kc—either to a broadcast station or to an RCA TMV-133-A Crystal Calibrator. The crystal calibrator should be connected for d-c plate operation, using 22½ volts or more with its output switch to its "Lo" position. This gives the seventh harmonic for the 700-kc signal. Connect a lead from any one of the output terminals of the Beat Frequency Oscillator to the antenna terminal on the receiver, leaving the receiver antenna connected. These operations will feed two signals into the receiver: (1) The broadcast station carrier or the Crystal Calibrator frequency, and (2) the fixed oscillator frequency from the Beat Frequency Oscillator. The second harmonic of the fixed oscillator will be used for indication since its fundamental is 350 kc. Adjust trimmer C-7 of the fixed oscillator (see figure 10 for location) until zero beat is heard in the receiver loudspeaker indicating that the fixed oscillator is correctly tuned to 350 kc. Disconnect the lead to the receiver antenna connection.

Variable Oscillator Alignment

After proper alignment of the fixed oscillator, as explained above, set the main frequency control to its 30-cycle position. Set the "Cal. Adj." pointer to its vertical position and place "indicator" switch to "Cal.", leaving the output control set to maximum. Adjust trimmer C-5 of the variable oscillator (see figure 10 for location) until zero beat occurs between the two oscillators. This point will be indicated when the neon lamp goes out entirely. A pair of headphones may be connected across the 5,000-ohm output terminals to obtain the same indication of zero beat. The oscillators are now properly aligned but the "Cal. Adj." setting is not correct for operation and must be adjusted as described under "Operation."

Output Calibration

Connect a 0—25-volt a-c meter, equivalent load 5,000 ohms, across the two output terminals marked "5000." If a 1,000-ohm-per-volt meter is used, connect a carbon resistor of approximately 6,000 ohms in parallel with the meter to obtain the equivalent 5,000-ohm load. Properly calibrate the instrument as described under "Operation." Place indicator switch to "On" and advance the output control to maximum. Set the main frequency control to its 1,000-cycle position. Adjust trimmer C-11 on the i-f transformer (see figure 9 for location) for 18 volts output. This is accomplished by screwing the trimmer all the way in and then unscrewing it to obtain the correct voltage. This places the transformer tuning on the lower side of resonance.

Resetting Controls

The main frequency control pointer should coincide exactly with the 15,000-cycle mark when the variable condenser is set to its position for maximum capacity. If, for any reason, this pointer does not stop at this position, remove the bakelite knob by loosening its set screw and loosen the two set screws in the collar to which the main pointer is attached. Turn the condenser shaft clockwise until the condenser plates are in their full-mesh (maximum-capacity) position. Set the pointer of the main frequency control exactly on the 15,000-cycle mark and tighten the set screws, making sure that neither the condenser shaft nor the pointer shifts as these screws are tightened; then replace the bakelite tuning knob. This setting must be exact for accurate frequency calibration.

The pointers on both the calibration-adjustment (Cal. Adj.) knob and the output knob should be in a vertical position when the controls are set midway between their stops. These knobs may be reset by loosening their set screws and resetting the knobs to their correct positions.

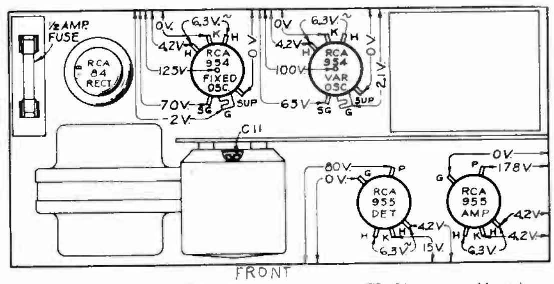


Figure 9—Radiotron Socket Voltages (top)

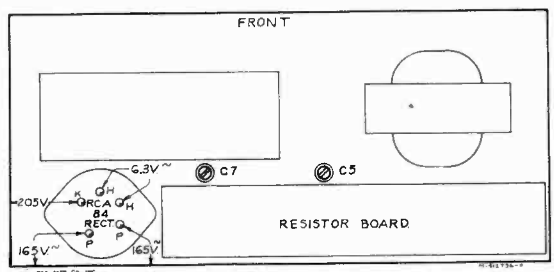


Figure 10—Radiotron Socket Voltages (bottom)

Radiotron Socket Voltages

Operating conditions of the basic circuits of this instrument may be determined by measuring the voltages applied to the tube elements. Figure 9 shows the voltage values from the socket contacts to ground and also those appearing across the heater contacts H-H on the four acorn-type Radiotrons on the top side of the chassis. Figure 10 shows the rectifier Radiotron voltages on the bottom side of the chassis. Each value as specified should hold within ±20% when the instrument is normally operative with all tubes intact and rated voltage applied. Variations in excess of this limit will usually be indicative of trouble.

The voltages given on this diagram are actual measured values and are the results obtained after the loading of the circuit, by the voltmeter, has taken place.

To fulfill the conditions under which these voltages were measured requires a 1,000-ohm-per-volt a-c/d-c voltmeter having ranges of 10, 50, and 250 volts. Use the nearest range above the voltage to be measured. The two oscillator shield cans must be unscrewed and removed to measure the voltages of the oscillator tubes.

Radiotrons

Under ordinary usage, within the ratings specified for voltage supply, tube life should be consistent with that obtained in other applications. Low output, inability to calibrate, or total failure of operation may be indicative of tube trouble. Caution should be taken to make sure that all tubes are in proper contact with their socket terminals.

If tube trouble is suspected, the tubes should be removed from their sockets and tested in a reliable tube-testing device. Replacing a questionable tube with one known to be good is another sure and definite means of tracing tube trouble. After replacing either of the oscillator tubes, the circuits should be re-aligned as explained under "Alignment procedure."

Fuse Replacement

A small ½-ampere cartridge fuse provides protection of the power system. The fuse block is mounted beside the RCA-84 rectifier tube socket on the top side of the chassis. This fuse is intended to protect the entire power system of this instrument and, therefore, should not be replaced with one having a higher rating nor be shorted out. A fuse failure should be carefully investigated before making a replacement since fuses of good quality fail only under conditions of overload. The cause may originate from a surge in the power-supply line, but more likely the reason may be found in the apparatus protected, such as shorted rectifier elements, etc. Poor contact of the fuse clips may result in an open fuse due to the heat developed. These contacts should, therefore, be kept clean and in secure contact with the fuse.

REPLACEMENT PARTS

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

Stock No.	Description	List Price	Stock No.	Description	List Price
4146	Block—Fuse block	.35	5030	Resistor—470 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
12334	Cap—Grid contact cap—Package of 5	.60	5199	Resistor—4700 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
12338	Capacitor—Adjustable capacitor as in oscillator coil assembly (C5, C7)	.46	11987	Resistor—4700 ohms—Carbon type—½ watt (R11)—Package of 5	1.00
12345	Capacitor pack—Comprising two 5 mfd., one 10 mfd., one 20 mfd., and one 12 mfd., sections (C17, C18, C19, C20, C23)	3.84	5114	Resistor—15,000 ohms—Carbon type—1 watt (R12)	.22
12332	Capacitor—33 mmfd. (C15)	.28	12070	Resistor—18,000 ohms—Carbon type—1/10 watt (R1, R2)—Package of 5	.75
11180	Capacitor—75 mmfd. (C14)	.16	11400	Resistor—27,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
8076	Capacitor—115 mmfd. (C13)	.20	11322	Resistor—39,000 ohms—Carbon type—¼ watt (R16, R17)—Package of 5	1.00
12340	Capacitor—450 mmfd. (C4)	.34	11646	Resistor—47,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
12339	Capacitor—470 mmfd. (C3)	.34	12333	Resistor—68,000 ohms—Carbon type—¼ watt (R5, R8)—Package of 5	1.00
12341	Capacitor—770 mmfd. (C1, C2)	.30	3118	Resistor—100,000 ohms—Carbon type—¼ watt (R7, R9, R10)—Package of 5	1.00
11812	Capacitor—2,000 mmfd. (C10)	.32	12478	Resistor—150,000 ohms—Carbon type—1/10 watt (R4)—Package of 5	.75
4836	Capacitor—.05 mfd. (C8, C9)	.30	4119	Screw—Set screw for indicator Stock No. 12479—Package of 20	.38
4841	Capacitor—0.1 mfd. (C21)	.22	12342	Shield—Oscillator coil shield	.30
4840	Capacitor—.25 mfd. (C16)	.30	12336	Socket—954 or 955 Radiotron socket	.52
12346	Clip—Neon lamp clip, terminal, washer and rivets	.36	4814	Socket — 5 - contact rectifier Radiotron socket	.15
4867	Coil—Choke coil (L7, L8)	.70	4750	Switch—Double pole double throw toggle switch (S2)	.94
12337	Coil—Oscillator coil—bobbin and coil only (L1, L2, L3, L4)	.98	7900	Switch—"ON-OFF" switch (S1)	.75
12344	Condenser—Variable condenser (C22)	2.48	12335	Transformer — Intermediate frequency transformer, complete with shield (L5, L6, C11, C12, R18)	2.34
12348	Condenser—Variable condenser for calibration adjustment (C6)	.84	12343	Transformer—Output transformer (T2)	4.56
12351	Escutcheon—Name plate escutcheon for front panel	2.58	12135	Transformer—Power transformer 105-125 volts 50-60 cycle (T1)	7.10
12350	Foot—Rubber foot—Package of 4	.22	12347	Volume Control—(R6)	1.22
3748	Fuse—½ ampere fuse (S4)—Package of 5	.40			
3982	Handle—Carrying handle	.60			
12479	Indicator—Frequency indicator pointer	.48			
12349	Knob—Main frequency adjusting knob—Package of 5	1.60			
3984	Knob—Variable calibrating condenser or volume control knob	.30			
4161	Lamp—Neon lamp	.56			
12477	Reactor—Filter reactor (L9)	2.78			

The prices quoted above are subject to change without notice.

First Edition

Electronic Sweep Oscillator

Stock No. 150 and 150A

IB-23357

Part I

OPERATING INSTRUCTIONS

WARNING — WHEN POWER IS ON, THERE IS A HIGH POTENTIAL WHICH MAY CAUSE SEVERE SHOCK. DISCONNECT POWER CORD BEFORE WITHDRAWING CHASSIS.

Introduction

The Stock No. 150 Test Oscillator is a compact, self-contained, a-c operated, portable instrument of high accuracy and stability designed especially for servicing and test purposes. The instrument supplies an r-f signal of approximately 0.25 volts over a frequency range of 90 to 32,000 kc in six (6) ranges. This r-f signal may be amplitude modulated approximately 30% at 400 cycles for alignment by meter or oscillograph or frequency modulated ±20 kc maximum at any frequency in the above range for use with the Cathode-Ray Oscillograph in visual alignment of i-f and r-f circuits. The sweep width of the frequency modulation is adjustable for any value between ±20 kc at maximum and ±0.5 kc at minimum. The Double Image Frequency Modulation is accomplished electronically (no moving parts) and is entirely free from amplitude modulation and requires no external parts, other than the Cathode-Ray Oscillograph, for visual work. A synchronizing voltage for locking the timing axis oscillator of the Cathode-Ray Oscillograph is supplied by the instrument. Each coil system (fixed and variable oscillator) is enclosed in individual compartments thus shielding them separately from the remainder of the oscillatory circuits and the output system.

From the earliest days of receiver measurements, the characteristics of selectivity and sensitivity were criterions by which receiver performance was judged.

One of the first methods of taking selectivity curves was to measure the input to the receiver necessary to give normal output at frequency intervals of 2 kc steps on each side of resonance up to frequencies where the required input was 10,000 times that required to give normal output at resonance. The curve was then plotted with carrier frequencies taken as the abscissa and the ordinate as a ratio of the required r-f input voltages at the respective measurement frequencies to the sensitivity limit of the receiver.

Another method used for taking selectivity data was to hold the r-f input constant and take output readings (of various frequencies covering the band width of the circuit) by means of a tube voltmeter. These readings when plotted versus frequency on each side of resonance, gave the selectivity curve of the circuit.

Various other methods have been developed in the laboratories to supplant these manual operations. These have taken the form of curve drawing equipments, in which the response of the circuit is traced on curve paper. This paper is moved in synchronism with the r-f frequency change and the variations in output tube voltmeter are followed with a pointer suitably connected with the pen tracing the curve.

Another method is the string galvanometer oscillograph commonly known as the visual. In this method the resonance trace is actually viewed on a screen.

A still later development is the Cathode-Ray method of viewing the resonance curves. This method, as does the oscillograph or visual method, requires an r-f oscillator whose frequency is varied by a rotating sweep condenser in shunt with the oscillator tuning capacitor. A commercial example of this type of equipment is the Test Oscillator, TMV-97-C and Frequency Modulator TMV-128 in conjunction with TMV-122 Cathode-Ray Oscillograph.

The outgrowth of these developments and various methods is the Frequency Modulated Oscillator Stock No. 150 in which all of the drawbacks associated with the mechanically operated systems have been overcome.

Figure 1 shows the general appearance of the instrument. The front panel carries the following controls:

1. Power switch.
2. Semi-full vision illuminated dial calibrated directly in kilocycles with high and low speed concentric knobs for tuning.

3. Three-position modulation control switch:
    1. No modulation (CW).
    2. Amplitude modulation (400 cycles).
    3. Frequency modulation.
4. Six-position range switch with following ranges:

Position	*Range KC*
1	90-325
2	325-1,000
3	1,000-2,500
4	2,500-7,000
5	7,000-14,500
6	14,500-32,000

5. Sweep width control with approximate calibration from 1 to 40 kc.
6. Output attenuator:
    (a) Stepped coarse control (3 positions).
    (b) Continuous fine control.
7. Output binding posts "High" and "Low."
8. Synchronizing bind posts "High" and "Low."
9. External modulation jack.

The test oscillator is shipped complete with Radiotrons. Figures 8 and 9 show the schematic and wiring diagrams respectively. A detailed description of the circuit and Radiotrons is given under Service Data.

Installation

After unpacking the instrument remove the seven (7) screws holding the front panel to the case and withdraw chassis and front panel feeding power cord through hole in back of case. Check radiotrons, pilot light and fuse to see if all are firmly in place; also check grid leads to see that all four are on the radiotron grid caps. Replace the case and securing screws and instrument is ready for operation.

Connections

R-F and I-F Test

Connect the output from the Test Oscillator to the Receiver under test. Connect the "High" terminal to Receiver antenna terminal for r-f alignment through a proper dummy antenna or resistor as advised in the Receiver Service Data (200-ohm resistor will usually give correct alignment) or to proper i-f grid for i-f alignment. The "0" terminal of oscillator is connected to the receiver ground (chassis) in either case. Reference to the receiver Instruction Book will disclose the proper points for making the input connections for either tests. Connect the receiver to an output indicating meter or to a Cathode-Ray Oscillograph for visual alignment. The output indicating device may be a second detector plate current meter, a voltmeter on output plates, or a voltmeter or indicating device across the cone coil.

I-F and R-F Test Using Cathode-Ray Oscillograph

The visual method of both i-f and r-f alignment is preferable. For this method the Cathode-Ray Oscillograph is preferably connected across the output of the second detector. Reference to Receiver Service Data will usually disclose the proper point of connection. The Oscillator, Receiver and Cathode-Ray are connected (preferably with low capacity shielded cable) as shown by Figure 3. If shielded cable is not available, standard flexible wire may be used if the various sets of leads are well separated from each other.

Overall Response

Connect output from Oscillator to r-f input of receiver as in r-f connections above. Place the modulation switch on "c-w" position. Plug in a Beat Frequency Oscillator such as TMV-134-A or other external modulating source into the external modulation jack. The Beat Frequency Oscillator output should be delivered through a low resistance output transformer, both leads of which must be isolated from ground and instrument case. The Beat Frequency Oscillator should be capable of delivering 11 volts rms when connected to a 5,000-ohm load for 30% modulation. An output meter having a flat frequency characteristic up to the highest audio frequency to be employed may be connected across the speaker cone coil; however, the Cathode-Ray Oscillograph is preferable.

Operation

General

With proper connections established between units for test being made, turn test oscillator power switch to "on" position and proceed to adjust as follows:

(1) Adjust the six-point range switch and tuning dial for desired r-f frequency. The tuning dial is calibrated directly in kilocycles with six scales, one corresponding to each position of range switch. The concentric tuning knobs give a coarse and fine control for tuning.

(2) Adjust the three-point modulation switch for the type modulation desired.*

(3) If frequency modulation is to be employed, adjust the sweep control for the desired sweep width.

(4) Adjust the output of the test oscillator to the particular test requirements. This consists of setting the stepped coarse control and continuous fine control to give desired output. Both controls

* If, due to sub-normal 6F7 characteristics, 400-cycle modulation of the output is not present, when the instrument is operating with "Modulation" switch set on "Amp" position, the "Modulation" switch should be momentarily rotated to the "Freq" position, and back to "Amp." This procedure will start the audio oscillator unless the circuit is actually defective.

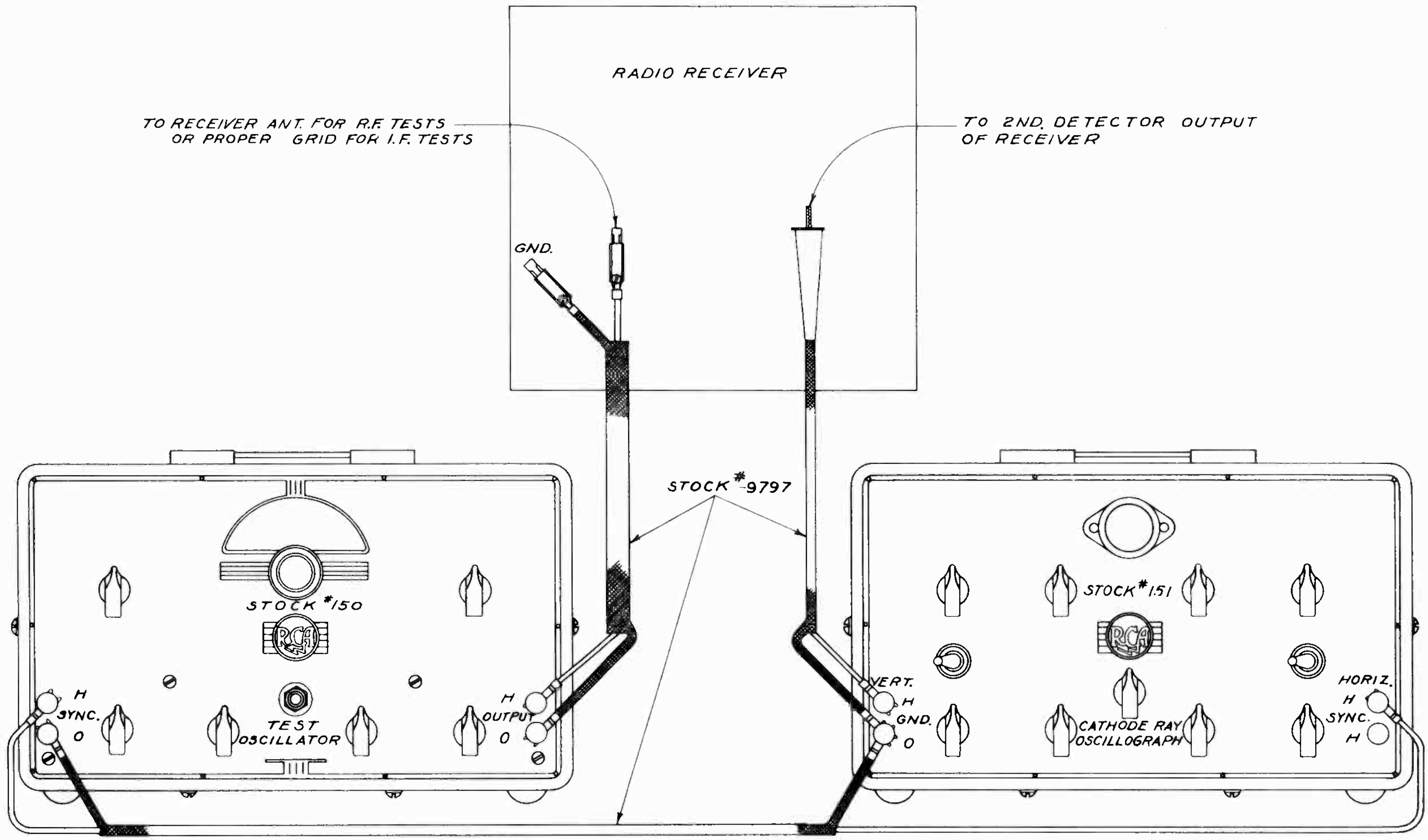


Figure 3—Connections for Receiver Test

at maximum gives approximately 0.25 volts. Lower signal output values should be obtained by reducing the stepped control to the approximate value desired and then making final adjustment with the fine control rather than trying to cover the entire reduction by use of the fine control.

I-F and R-F Alignment with Indicating Meter

With modulation switch set for amplitude modulation, adjust the attenuator controls to give the desired reading on the indicating meter on the output of the receiver. The receiver i-f or r-f trimmers should then be adjusted in accordance with the instructions in the Service Notes for the particular receiver. To avoid a-v-c action in receiver on r-f alignment, it is advisable to use the minimum signal from the test oscillator at which alignment can be affected. The Service Data for the receiver generally suggests a method for eliminating a-v-c action during alignment. If this suggestion is followed, the input will not be critical but must always be kept below the overload point for the receiver.

I-F Alignment with Cathode-Ray Oscillograph

Connections are made as shown in Figure 3 and the test oscillator modulation switch is set for frequency modulation and adjusted for desired sweep width. The cathode-ray horizontal timing axis oscillator should be synchronized and locked at 120 cycles or 50 cycles in 25-cycle models. This may be accomplished by adjusting timing axis frequency to give ½-cycle on tube screen with 60-cycle pickup for 60-cycle models or 25-cycle pickup for 25-cycle model on the vertical amplifier (see Figure 4-f), or adjusting for two superimposed resonance curves on the screen with receiver being swept by test oscillator.

The test oscillator output should be coupled to the grid of the tube preceding the i-f stage under alignment. It is essential that this connection be made without altering any of the operating characteristics of this stage. If the grid of the tube to which connection is to be made is at zero d-c potential with respect to ground, connect the oscillator to the grid of the tube and disconnect the

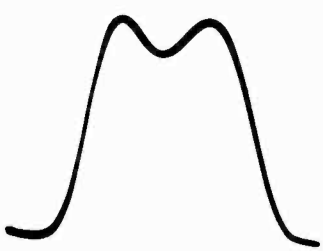


Figure 4-a

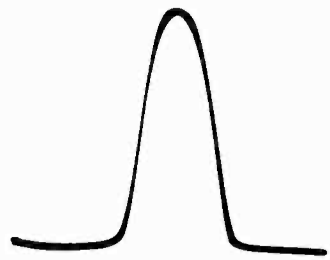


Figure 4-b

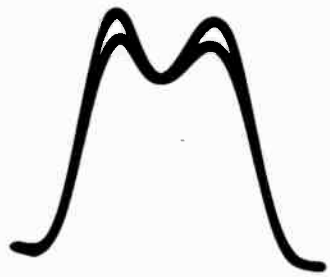


Figure 4-c

Figure 4-d

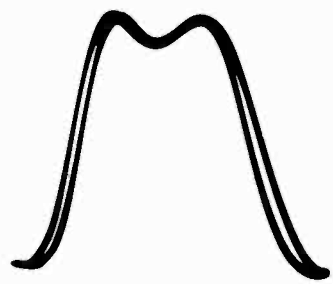


Figure 4-e

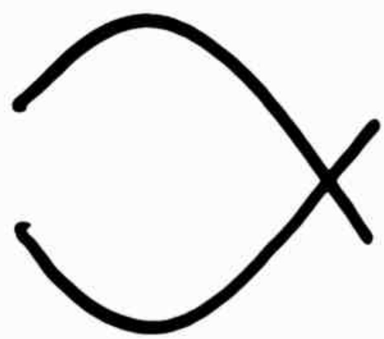


Figure 4-f

lead normally on the grid, the low side of the test oscillator output returning to chassis ground. If the grid is not at zero d-c potential with respect to ground, connect the high side of the test oscillator to the grid (disconnecting the lead on the grid) and the other side to the "—C" lead for this grid.

The "Vertical" binding posts of the oscillograph should be connected to the audio output of the second detector. For a diode detector this connection may be across the volume control alone or across both the volume control and automatic volume control resistor, if this connection is convenient. When the second detector is a triode, tetrode or pentode, resistance-coupled to the first audio stage, the connection to the "High" binding post may be to the plate of the tube. The "0" post being connected to ground. In the case of a triode, tetrode or pentode, transformer or impedance-coupled to the first audio stage, connect a resistor of approximately 20,000 ohms in series with the plate of the tube and by-pass the inductance in the plate circuit by a 1.0 mfd. or larger capacitor. This changes the impedance of the plate circuit to resistance rather than inductive reactance; the "High" binding post should be connected to the plate of the tube and the "0" post to ground in order to take the audio voltage off this resistor.

With above connections and adjustments properly made, two superimposed resonance traces should appear on the Cathode-Ray Oscillograph screen. The i-f trimmers are then adjusted for complete symmetry and maximum amplitude of the two traces. When this occurs the stage is symmetrically aligned with respect to the i-f frequency (see Figures 4a, 4b, 4c and 4d).

In cases where complete symmetry of curves cannot be obtained the amplitude increases rapidly when alignment frequency is approached, trouble is apt to be regeneration in the i-f stages. This may be coupling in the common power supply due to an open by-pass capacitor, capacity coupling between stages, absence of proper tube shields, etc. In any event it is indicative of trouble which, when corrected, will allow transformer to be aligned symmetrically.

The i-f stages should be aligned in reverse order starting at last stage and working forward toward the first detector. During i-f alignment, the receiver tuning dial should be set at some point where a variation in its position has no effect on the i-f curves.

R-F Alignment with Cathode-Ray Oscillograph

R-F alignment is effected in a similar manner and after the i-f alignment is completed, except that the test oscillator output is connected to receiver antenna and ground and the r-f frequency selected to suit the aligning points. The receiver alignment points will be specified in the Service Data for the set. The receiver oscillator trimmer should be adjusted first for correct frequency, then the first detector and r-f trimmers for symmetry and maximum height of the two curves. If the first detector and r-f trimmers shift the frequency (shift the resonance curves apart) the oscillator trimmer should be readjusted to bring the receiver back to proper frequency.

The receiver should then be tuned to the low frequency end of the band, the test oscillator changed to the low frequency aligning point and the receiver low frequency oscillator trimmer adjusted for symmetry and maximum height of curves.

Refer to detailed circuit description under Service Data and note that, due to the beat frequency principle on which this instrument operates, there will be present in the output, frequencies corresponding to the sum of the two oscillators, the difference and the fundamental of the variable oscillator, the harmonics of the fixed oscillator being effectively suppressed. On the higher frequencies the sum and difference frequencies will be present 1,600 kc apart with the variable oscillator half-way between. The dial scale is calibrated in terms of the sum frequency on the last two bands. In order to determine if the receiver is tuned to frequency indicated by the dial scale, where there may be some doubt on the higher frequencies, it is advisable to turn modulation switch to frequency modulation and tune the receiver to these two points. The variable oscillator will appear with no modulation half-way between these two, i. e.:

Oscillator set at 20 megacycles.
3 signals present.
1 at 20,000 kc frequency.
1 at 19,200 kc unmodulated.
1 at 18,400 kc frequency modulated.

When using amplitude modulation, the 400-cycle audio modulation will appear superimposed on the oscillographic image between approximately 799 and 801 kc. When using frequency modulation, extraneous traces may appear on the oscillograph screen if the test oscillator tuning is within the Sweep K.C. setting of the fixed oscillator. Example: Sweep K.C. control set at 20, extraneous traces may then appear when the test oscillator and receiver are tuned to a frequency between 780 and 820 kc. In the majority of cases, the selectivity of the i-f system of the receiver will govern the frequency limits at which these waves will appear and it will be possible to obtain an image on the oscillograph screen free from extraneous waves up to ± 10 kc or less from 800 kc. These extraneous traces will appear, one on each side of the desired double-image trace as the test oscillator tuning approaches 800 kc, at which point the extraneous and desired traces coincide and give an audio beat-note pattern. When aligning, the extraneous traces should be disregarded and the main center traces used. Alignment may be affected, in the majority of cases, within 5 kc of the 800 kc fixed oscillator signal even though audio modulation pattern may be noticeable on the lower portion of the desired curves.

If receiver dial scale calibration is out so that these readings do not check, tune receiver to the highest of the three. The receiver will then be correctly tuned to the frequency indicated by test oscillator dial. On the four lower bands the 1,600 kc difference is far enough apart so as to not be confusing but it should be borne in mind that the dial scale is calibrated in terms of the difference frequency and the lowest of the three signals should be used if doubt exists.

If a frequency of exactly 800 kc is desired, the range selector should be placed to the highest frequency position (14,500—32,000 kc) and the test oscillator connected as previously outlined for the particular application. The output signal will then be from the fixed oscillator only. All controls function normally except the tuning control, which will have no effect at 800 kc when range selector is placed in position stated.

R-F Alignment with Output Meter

The alignment procedure outlined above should be followed except that the r-f trimmers should be peaked, using an output meter across speaker voice coil, with 400 cycles amplitude modulated signal from the test oscillator.

Overall Response Tests

With proper connections established between units, tune receiver to 1,000 kc. Adjust test oscillator controls for r-f frequency and output as required. Readings of receiver output may then be taken on the output meter or observed on a Cathode-Ray Oscillograph. The beat frequency oscillator output may be set at a value to give the desired percentage modulation. (A voltage of 11 volts rms will modulate the Stock No. 150 approximately 30 per cent.) Since the modulation characteristic of the oscillator is linear, any other percentage may be computed on the basis of 11 volts rms equals thirty per cent.

EXAMPLE: 60% = 22 volts rms, etc.

Calibration

The instrument operates on the beat frequency principle but the dial scale is calibrated directly in kilocycles in terms of the mixed output. The variable oscillator frequency is held to a very close tolerance giving a dial scale accuracy of better than $\pm 1\%$ between the frequencies of 1,000 kc and 32,000 kc. Below 1,000 kc this accuracy may be slightly less.

Part II
SERVICE DATA

Electrical Specifications

Power Supply Rating	Voltage	110–120 volts AC
	Frequency (Stock No. 150)	50–60 cycles*
	(Stock No. 150-A)	25–40 cycles*
	Power Consumption	30 watts
	Fuse Protection	½-ampere
Range and Applications	R-F Frequency	90-32,000 kc
	Sweep Frequency	±20 kc max.
	Audio Modulation Frequency	400 cycles
	Output	0.25 volt
	Output Impedance	10, 100 and 1,666 ohm at max.
Radiotrons Used and Functions	1 RCA-80	Full wave rectifier
	1 RCA-6F7	Triode section—audio oscillator Pentode section—R-F oscillator (fixed oscillator)
	1 RCA-6A7	Triode section—R-F oscillator (variable oscillator) Pentode section—Mixer
	1 RCA-6C6	Sweep voltage generator
	1 RCA-6C6	Frequency control tube

Physical Specifications

Mechanical Specifications	Height	9¼ inches
	Width	13¾ inches
	Depth	7½ inches
Weight:	60 cycle	17 pounds
	25 cycle	18½ pounds

*All foregoing instructions are based on the operation of an instrument rated at 60-cycles power supply. On instruments of frequency ratings other than 60-cycles the instructions should be interpreted in terms of the actual operating frequencies; i. e., on 25-cycle equipment the cathode-ray oscillograph timing axis oscillator would be locked at 50-cycles. The instrument is supplied in two models:

Stock No. 150 —Rated for 50–60-cycle operation, connected at the factory for 60-cycle operation.

Stock No. 150-A—Rated for 25–40-cycle operation, connected at the factory for 25-cycle operation.

To operate the No. 150 on 50-cycle power supply or the 150-A on 40-cycle supply, a slight change in connections is necessary in order for the sweep voltage dial scale calibration to be correct for these odd frequencies. These changes are as follows:

To operate the No. 150 on 50-cycle supply, a 0.1 mfd. capacitor should be added in parallel with the existing sweep voltage capacitor, C-1.

CAUTION: The Model No. 150 should not be operated on power supply frequency of less than 50-cycles.

To operate the No. 150-A on 40-cycle supply, remove the jumper between the terminals of capacitor C-43, located at rear of chassis (top side). This reduces the value of the sweep voltage capacity from 2.0 mfd. to 1.5 mfd. and corrects the dial scale calibration for 40-cycle operation.

To operate the No. 150-A on 60-cycle power supply, remove the jumper between sweep voltage capacitor C-1 and C-43. This reduces the sweep voltage capacity from 2 to 1 mfd. identical to that of the 60-cycle model.

To operate the No. 150-A on 50-cycles, it follows that C-1 should be 1.1 mfds.

Circuit Description

The Stock No. 150 Test Oscillator consists of two radio frequency oscillators (one fixed and one variable) whose output are combined in a mixer tube to provide the desired radio frequency output. Either amplitude modulation (400 cycles) or frequency modulation (of ±20 kc maximum) of the output frequency may be obtained, depending on which type of modulation is employed on the fixed oscillator. Referring to the schematic (Figure 8) the following action takes place:

A fixed r-f oscillator, consisting of the pentode section of an RCA-6F7 Radiotron and its associated inductance and capacity oscillates at a frequency of 800 kc. A pickup coil coupled to this tank circuit feeds energy from this oscillator into the No. 4 grid of the RCA-6A7 combination oscillator mixer tube. The triode section of this tube, together with its associated inductances and capacities make up the variable oscillator which is tuned by the variable capacitor, C-7. Due to coupling in the electron stream there will appear in the output plate circuit of this RCA-6A7 frequencies corresponding to the sum and difference of frequencies of the two oscillators. The tuning dial is calibrated directly in kilocycles corresponding to the difference of the two oscillator frequencies up to 7 megacycles. Above 7 megacycles the sum frequency is used. The foregoing description applies for the condition of no modulation on fixed oscillator. When amplitude modulation is employed the same action holds true except that the triode section of the fixed oscillator tube oscillates at 400 cycles and is coupled externally to the r-f oscillator section so as to impress audio voltage in series with the plate supply of the oscillator section. The resultant output voltage from the RCA-6A7 tube is amplitude modulated an amount equivalent to the modulation impressed on the fixed oscillator.

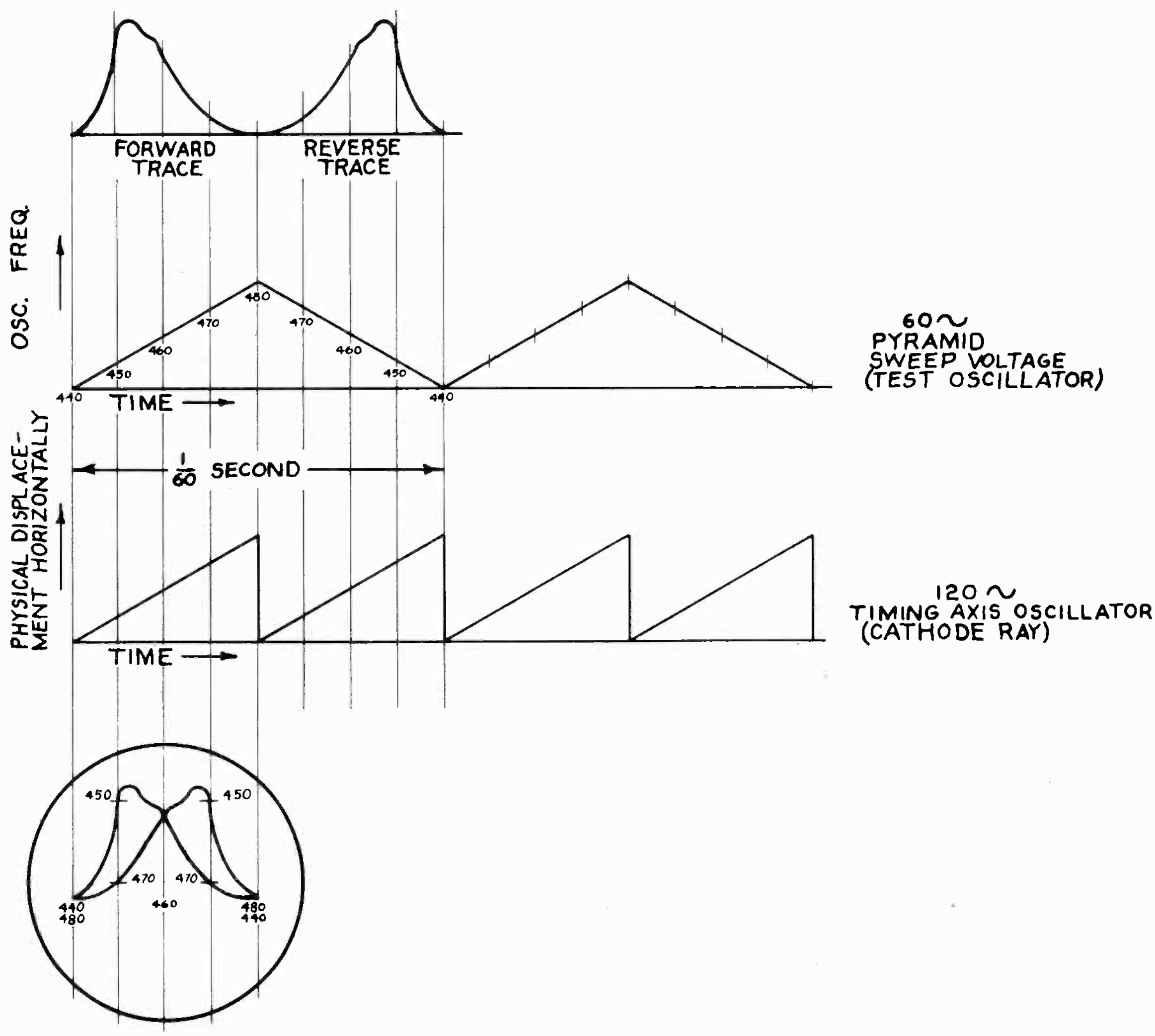


Figure 5—Resultant Curves on Cathode-Ray Screen

When frequency modulation is employed the above action of the variable oscillator and mixer tubes still holds true but the signal from the fixed oscillator delivered to the No. 4 mixer grid is being varied at a low frequency rate (frequency modulation), consequently the output frequency from the mixer tube will vary in a like manner. Frequency modulation of the fixed oscillator is brought about in the following manner:

The work plate of the RCA-6F7, electron coupled to the fixed oscillator, builds up an out-of-phase r-f voltage across capacitor C-22, which is coupled to the grid of the RCA-6C6, called the frequency control tube. The plate of this tube is connected directly across the grid tank circuit of the fixed oscillator. With voltage of proper phase angle on the grid of the RCA-6C6 (corrected by network C-21, R-18) the output of this tube appears to the oscillating tank circuit as a shunt inductance. This inductance and hence the oscillator frequency may be varied up or down within limits by raising or lowering the bias on the frequency control tube and so varying its gain. This is accomplished by varying the bias on this tube around a fixed point with a linear 60-cycle pyramid wave form generated by the second RCA-6C6 tube. The pyramid wave form is employed to obtain double image response or the folding back of the forward and reverse resonance traces of a circuit. A brief explanation of double image response follows:

Refer to Figure 5 and assume that the oscillograph timing axis oscillator is locked at 120 cycles, exactly twice the frequency of the pyramid sweep voltage, and that the horizontal deflection progresses from left to right on screen of the cathode ray. In 1/120-second the r-f oscillator frequency progresses from 440 to 480 kc, tracing the response curve on the screen from left to right, controlled horizontally by the timing axis oscillator. At the end of 1/120-second, the oscillator frequency starts decreasing and during the next 1/120-second changes from 480 to 440 kc. At the reversal point (peak of the pyramid voltage) the saw-tooth oscillator has caused the horizontal deflection to reach its maximum on tube screen, drops to zero and returns the beam to the left side of the screen. It then builds up again, tracing the reverse resonance curve (480-440) of the second half of the sweep cycle, thus giving the two superimposed curves, i.e., being the reverse of each other with respect to frequency except at the point corresponding to the alignment frequency. It will be noted that in the above figure the transformer is purposely shown misaligned so that both traces will be fully visible.

A feature of the instrument which should be explained at this point is the variable band sweep. In the explanation and figures of double image response the sweep was referred to as being 40 kc in width (440-480) as this is the maximum sweep. If, when viewing a transformer, this sweep is too great (transformer response is narrow), the sweep can be narrowed to any amount desired by setting sweep control to desired value spreading the transformer response on the Cathode-Ray Oscillograph screen. This change in sweep is effected by changing the amplitude of the pyramid voltage applied to the grid of the frequency control tube by means of the sweep voltage control R-1 which is calibrated in kc sweep. This change in the amount of bias swing changes the gain of this tube, thus controlling the amount of sweep. The variation in nominal frequency setting due to a reduction in sweep from 40 to 5 kc is very small. This is a constant amount and at the higher frequencies represents a negligible percentage. At 400 kc this amounts to approximately ¼ of 1%. If alignment frequency is desired closer than these tolerances it is advisable to calibrate the instrument at the alignment frequency with the sweep adjusted to the desired amount. The amount of sweep for any setting of the sweep control remains constant for all r-f frequencies.

Another feature of the instrument is the absence of amplitude modulation when frequency modulation is employed.

Amplitude modulation takes place, to some extent, in test oscillators using rotating condenser, etc., as means of frequency modulation. This amplitude modulation cannot be checked by simply rotating condenser by hand and measuring output voltage as it occurs due to the rate of change of frequency (dynamic characteristic of circuit). It can only be found by comparing the visual picture with the alignment curve taken with laboratory curve drawing equipment. This amplitude modulation (output less at one end of sweep band than other) causes a properly aligned circuit to appear somewhat misaligned when viewed on the oscillograph. When frequency modulation is accomplished electronically it is possible to overcome this defect by proper compensating networks so that resonance curve as viewed on the oscillograph screen is an exact duplicate of one drawn by point to point test methods or one drawn by laboratory curve drawing equipment. Misalignment due to amplitude modulation as it occurs in the older systems of frequency modulation is quite noticeable in the older type of radio receivers using peaked i-f transformers and is extremely so in the newer flat topped i-f transformers. This misalignment may cause serious receiver interference from adjacent channel transmitters.

For a more detailed explanation of double image response and its advantages refer to Cathode-Ray Oscillograph Instruction Books, TMV-122-A.

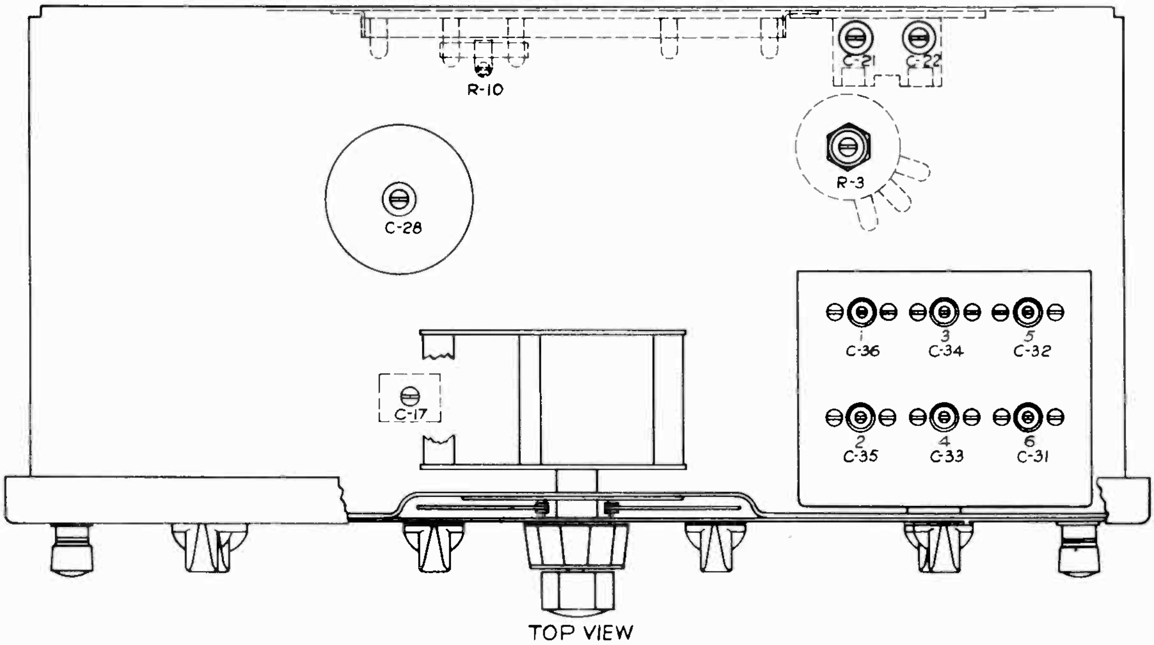


Figure 6—Adjustment Locations (Top View)

Alignment

Correct alignment of both oscillators, correct adjustment of amount of d-c voltage on the plate of the sweep voltage generator tube and correct bias adjustment of frequency control tube bias are necessary for proper output and frequency calibration. These adjustments should be checked periodically and especially after replacing tubes, or making repairs or replacements. For a periodic check where no tubes, other than RCA-6A7 or 80 have been replaced, proceed as follows: Remove instrument from case and place bottom down on a metal bench or piece of sheet metal. Place the instrument in operation. Make connections to a radio receiving set and Cathode-Ray Oscillograph as for r-f alignment. Obtain a crystal calibrator or other accurate frequency source. If crystal calibrator is used it should be connected for d-c operation with the frequency switch set on "Low" position. Tune the receiver to 800 kc (8th harmonic of the calibrator). Set modulation switch on No. 150 Oscillator for frequency modulation and adjust cathode ray for double image sweep. The tuning dial on the 150 should be set at some point where a variation in tuning will not affect the resonance curve of the receiver being swept by the fixed oscillator. With these connections and adjustments properly made the two response curves of the receiver should appear on the cathode-ray screen with a visible beat note marker caused by the beat of the 150 and crystal calibrator. Next, adjust the fixed oscillator trimmer, C-28, located in the top of the fixed oscillator shield can, so that the two traces, on cathode-ray screen, coincide at their peaks. The visible beat note from the crystal calibrator should occur at the peaks of the curves. Change modulation switch to C-W position and adjust trimmer C-17, located on bottom side of chassis with hole for trimming (at left side of tuning condenser facing front of instrument), for zero beat with the crystal calibrator, observing beat on Cathode-Ray Oscillograph. The fixed oscillator frequency is then properly adjusted and compensated for the three positions of the modulation switch. To adjust dial scale calibration only the receiver and crystal calibrator are required. The dial scale should be checked to see that the mark for maximum capacity is on the indicating line with the capacitor plates fully in mesh. Connect output of the 150 to the input of the receiver together with a lead coupled to the crystal calibrator. There are six air trimmers, one for each band, with the following alignment points:

1— 330 kc (C-36)	4— 7,000 kc (C-33)
2—1,000 kc (C-35)	5—14,500 kc (C-32)
3—2,500 kc (C-34)	6—32,000 kc (C-31)

For the first band tune receiver to 3,300 kc (33rd harmonic of calibrator) on low output and adjust trimmer for zero beat, using 10th harmonic of 330. For the third band, set receiver to 5 mc and use calibrator on high output, using the 5th harmonic of calibrator and 2nd harmonic of 150, and adjust trimmer for zero beat.

On all other bands the fundamentals of the 150 are used together with the proper harmonic of the calibrator set on low or high output as required. Care must be exercised at the higher frequencies to tune the receiver to the proper harmonic of the crystal calibrator since the image from the 1,000-kc step above the point desired is very close, in some instances, to the step desired, i. e., in a receiver using 460-kc i-f transformers, fundamentals from the calibrator will be present at 23,000, 24,000, 25,000, etc. Images will be present at 23,080, 24,080, 25,080, etc., and in sets with low r-f selectivity these images may appear as strong as the true signals. Another point to watch is the two responses from the test oscillator which are 1,600 kc apart. The last two bands are calibrated in terms of the sum frequency so the highest response should be used on these two bands.

When tubes other than RCA-6A7's or RCA-80's have been replaced, the following adjustment should first be made and then the calibration checks made as previously outlined.

(1) Frequency Control Bias Adjustment, R-10

This following adjustment must be made in the event of tube replacement:

Place Oscillator in operation on frequency modulation with Sweep Width Control at maximum. Make connections between the Oscillator, Receiver and Cathode-Ray Oscillograph as for r-f alignment. Set oscillator frequency at some point at which receiver dial scale has 5 kc graduation in frequency. Example: 200 kc on "X" band of most all wave receivers.

Tune receiver to resonance with oscillator, that is, until the two traces coincide at their peak. The oscillator frequency may be shifted slightly to make the traces coincide at some exact frequency, 200 kc for example. Now tune the receiver to the extremes of the r-f sweep. This may be 190 kc on the low frequency side and 230 kc on the high frequency side. The bias resistor, R-10, is now adjusted so that the extremes of the sweep are symmetrical above and below the nominal frequency. The receiver dial scale is generally accurate enough for this work; however, if increased accuracy is desired, an external oscillator should be used to beat the frequency extremes. The frequency extremes referred to above are represented on the cathode-ray screen when the receiver is tuned so that one-half of the resonance trace of the receiver appears at each end of the line of horizontal deflection.

(2) Adjustment of DC on Sweep Voltage Generator, R-3. Screwdriver Adjustment on Top of Chassis. (Located Near Variable Oscillator Shield Can Assembly.)

This adjustment should be checked immediately after replacement of a tube or any part associated

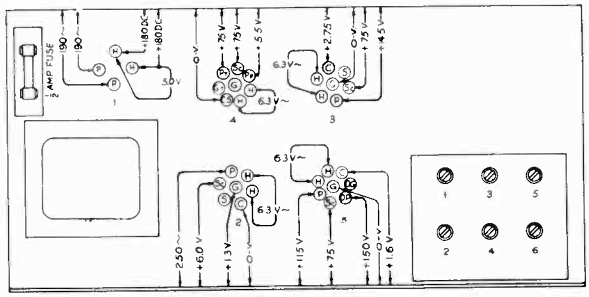


Figure 7—Tube Voltage Diagram

with this circuit. Any mis-adjustment of this circuit will be evident only on over-coupled circuits (double peaked i-f transformers, see Figure 4e) and causes one trace to be slightly inside the other, depending on the amount of mis-adjustment.

To adjust R-3 proceed as follows: Align an over-coupled transformer so that the peaks coincide (see Figure 4e), then adjust R-3 until the sides of two traces coincide (see Figure 4a).

(3) Adjustment of Phase Angle Compensation and R-F Feedback Voltage, Capacitors C-21 and C-22, respectively. (Located at Right Rear Top of Chassis.)

These two adjustments are not affected by tube replacements. They are accurately adjusted at the factory and under no condition (except failure of C-21, C-22 or R-18) should their adjustment be disturbed. If, due to failure, either of these three parts require replacement, the following procedure is given for the proper alignment of this network:

(A) Adjust fixed oscillator on frequency modulation for correct band-width and frequency and compensate for pure frequency modulation. (Two trimmer adjustments.)

The following equipment will be required:

(a) A double peaked i-f transformer at some convenient frequency, 460 kc for example, working out of a mixer tube and into a diode.

(b) A variable r-f signal source such as a RCA TMV-97-C Test Oscillator capable of being operated 460 kc above and below the 800 kc fixed oscillator to produce the i-f signal. Compensation for pure frequency modulation is brought about as follows: With the i-f transformer properly tuned, adjust compensation trimmer so that response of the transformer is identical when the 460 kc signal is produced in the mixer tube by a 340 kc signal or a 1,260 kc signal from the signal source beating with the 800 kc fixed oscillator.

(4) **Adjustment of Sweep Width Control, R-1. (Located at Top Left Side of Front Panel.**

If this unit is to be replaced, proceed as follows: Remove old control and assemble new control in place, making sure that knob is assembled with set screw on flat of shaft, but do not wire. Turn knob to maximum clockwise position. Connect an ohmmeter or resistance bridge between the rotor terminal and the high end of the control. The resistance reading should be zero. Now rotate knob counter-clockwise until a resistance reading of 120 ohms is obtained. Leave knob set at this position, remove ohmmeter, loosen locking nut on back side of panel and rotate potentiometer, being careful not to disturb setting of knob, until knob pointer coincides with the 40 kc mark on the dial scale. Tighten locking nut with knob pointer in this position. The control is then correctly calibrated. replace wires on control and it is then ready for operation. If a control becomes loosened on front panel, the calibration is corrected as outlined above.

Radiotrons

Under ordinary usage, within the ratings specified for voltage supply. tube life should be consistent with that obtained in other applications. Low output, inability to obtain modulation, or total failure of operation may be indicative of tube trouble.

If tube trouble is suspected, the tubes should be removed from their sockets and tested in a reliable tube-testing device. Each tube should be replaced in the socket from which it was removed. Replacing a questionable tube, with one known to be in good condition, is another sure and definite means of tracing trouble. When replacements of the tubes are made, the adjustments of controls should be performed as outlined previously.

Radiotron Socket Voltages.

Operating conditions of the basic circuits of this instrument may be determined by measuring the voltages applied to the tube elements. These values are shown by Figure 7. The values shown should hold within ±20% when the instrument is normally operative with all tubes intact and rated voltage applied. Variations in excess of this limit will usually be indicative of trouble. To fulfill the conditions under which these voltages were measured required a 1,000-ohm/volt AC/DC meter having ranges of 3, 30 and 300 volts, using the nearest range above the voltage to be measured.

Maintenance

The various diagrams given in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, and inductances are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, and C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. These identifications are in a sequence which begins at the left of the diagram and increases numerically from left to right, thus facilitating the location of such parts on the schematic diagram.

The coils, reactors, and transformer windings are rated in terms of their d-c resistance. This method of rating provides ready means for checking continuity of circuits. Suspected faulty circuits or parts may be checked and their resistances compared with the value given on the schematic diagram.

Failure of operation may result from:

(1) Power supply being "off."

(2) Open fuse within the instrument.

(3) Defective tubes.

(4) Defects within the instrument itself.

Low output or improper calibration may result from:

(1) Improper alignment of the various circuits.

(2) Oscillator coil shields loose or removed.

(3) Defective tubes.

(4) Improper setting of control knobs on shafts.

(5) Defects within the instrument itself.

CAUTION.—Disconnect power supply before removing case.

Fuse Replacement

A small ½-ampere cartridge fuse provides protection of the power-supply system, and should not be replaced with one of higher rating, nor be shorted out. A fuse failure should be carefully investigated before replacement since a fuse of good quality fails only under conditions of overload. The fuse clips should be kept clean and in secure contact with the fuse at all times.

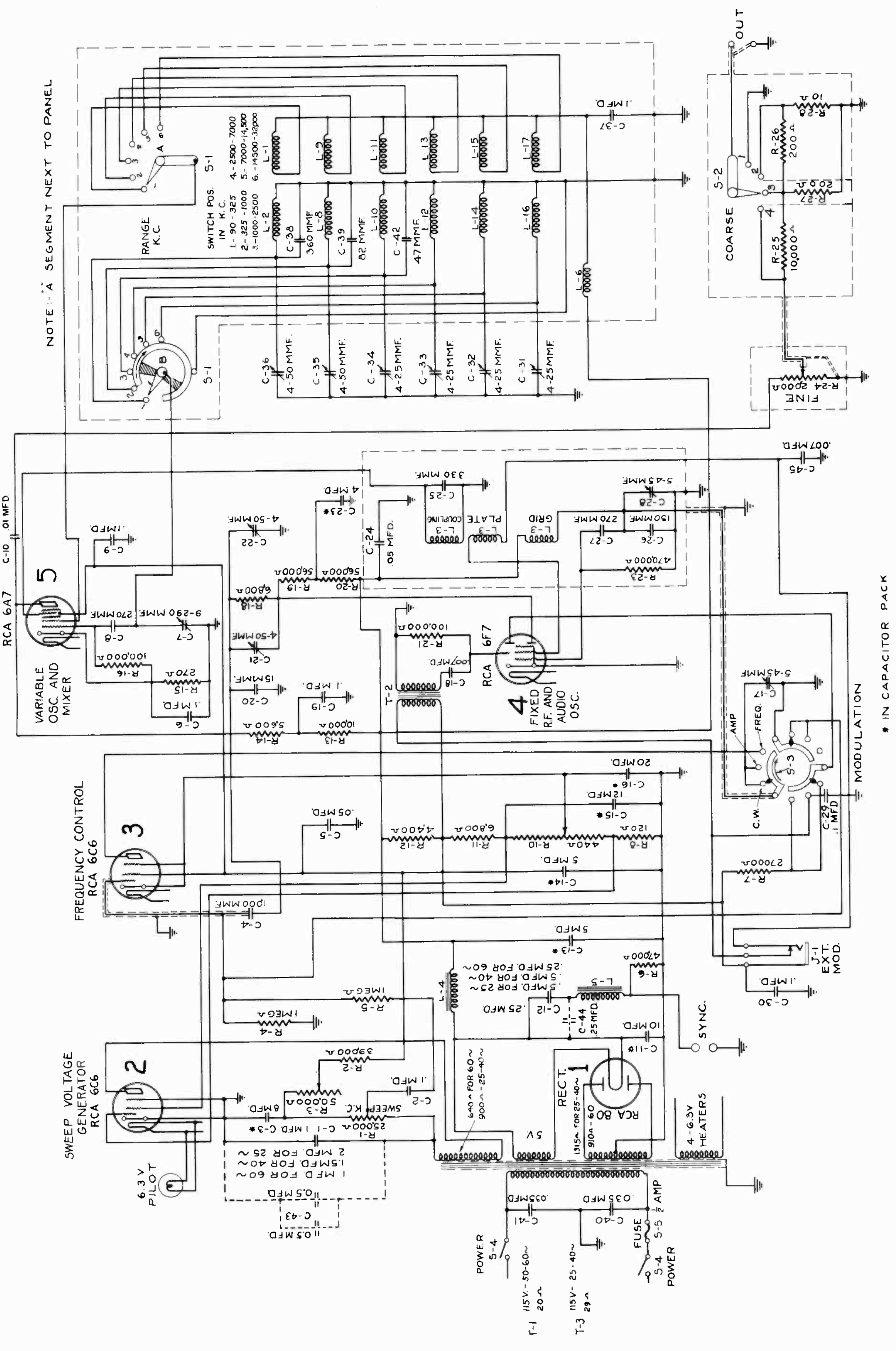


Figure 8—Schematic Diagram, Test Oscillator T-611031

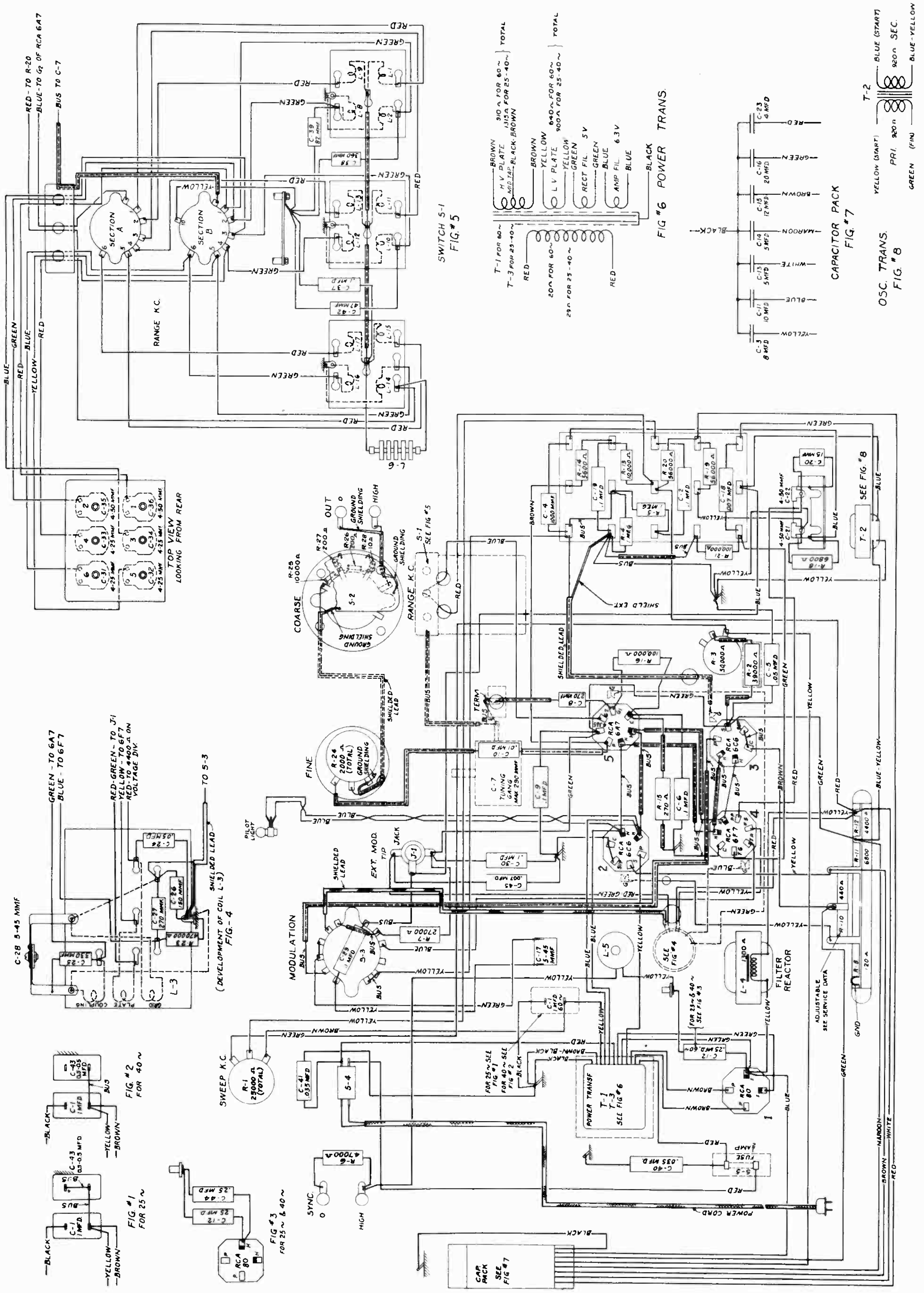


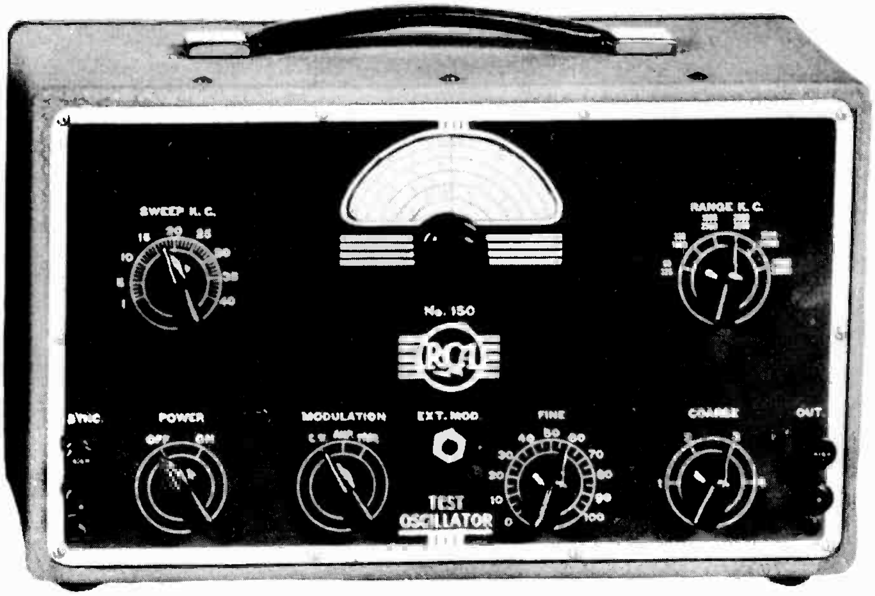
Figure 9—Connection Diagram, Test Oscillator
W-302137

REPLACEMENT PARTS

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

Stock No.	Description	
13991	Transformer—Power transformer 110 Volt, 50-60 Cycle	(T1)
3979	Transformer—Osc. Transformer	(T2)
14144	Transformer—Power transformer 110 Volt, 25 Cycle	(T3)
13210	Fuse Block	
12118	Cap—Grid Contact Cap	
11897	Capacitor—1 Mfd., 250 Volts, Oil Filled	(C1)
11414	Capacitor—0.1 Mfd., 300 Volts	(C2)
13966	Capacitor Pack—consisting of one 4 Mfd., two 5 Mfd., one 8 Mfd., one 10 Mfd., one 12 Mfd., one 20 Mfd.	(C3, C11, C13, C14, C15, C16, C23)
13434	Capacitor—1000 Mmfd.	(C4)
4836	Capacitor—.05 Mfd., 150 Volts	(C5)
4841	Capacitor—.1 Mfd., 150 Volts	(C6, C9)
13968	Condenser—Tuning	(C7)
12488	Capacitor—270 Mmfd.	(C8, C27)
4858	Capacitor—.01 Mfd., 200 Volts	(C10)
4840	Capacitor—.25 Mfd., 200 Volts	(C12)
13969	Condenser, Trimmer—Mica. 5-45 Mmfd.	(C17, C28)
5148	Capacitor—.007 Mfd., 400 Volts	(C18)
4841	Capacitor—.1 Mfd., 200 Volts	(C19, C29, C30, C37)
12896	Capacitor—15 Mmfd.	(C20)
13970	Condenser—Double trimmer Mica. 5-45 Mmfd.	(C21, C22)
12952	Capacitor—330 Mmfd.	(C25)
12725	Capacitor—150 Mmfd.	(C26)
13971	Condenser—Air Padding Trimmer—4-25 Mmfd.	(C31, C32, C33, C34)
13972	Condenser—Air Padding Trimmer—4-50 Mmfd.	(C35, C36)
13967	Capacitor—360 Mmfd.	(C38)
12813	Capacitor—82 Mmfd.	(C39)
5196	Capacitor—.035 Mfd., 400 Volts	(C40, C41)
13141	Capacitor—47 Mmfd.	(C42)
16420	Capacitor—2 Sections each .5 Mfd.	(C43)
4840	Capacitor—.25 Mfd.	(C44)
13986	Potentiometer, Var. 25,000 Ohms	(R1)
11322	Resistor—39,000 Ohms, ¼ Watt	(R2)
13984	Potentiometer, Var. 50,000 Ohms	(R3)
3033	Resistor—1 Meg. Ohm, ¼ Watt	(R4, R5)
11646	Resistor—47,000 Ohms, ¼ Watt	(R6)
11400	Resistor—27,000 Ohms, ¼ Watt	(R7)

Stock No.	Description	
13987	Resistor—Voltage divider, consisting of 120 ohms, 440 ohms adjustable, 6,800 ohms, 4,400 ohms	(R8, R10, R11, R12)
3381	Resistor—10,000 Ohms, ¼ Watt	(R13)
11647	Resistor—5,600 Ohms, ¼ Watt	(R14)
6135	Resistor—270 Ohms, ¼ Watt	(R15)
5145	Resistor—100,000 Ohms, ¼ Watt	(R16, R21)
11726	Resistor—6,800 Ohms, ¼ Watt	(R18)
5029	Resistor—56,000 Ohms, ¼ Watt	(R19, R20)
11172	Resistor—470,000 Ohms, ¼ Watt	(R23)
13985	Potentiometer, Var. 2,000 Ohms	(R24)
13736	Resistor—10,000 Ohms, ¼ Watt	(R25)
13248	Resistor—200 Ohms, ¼ Watt	(R26, R27)
13988	Resistor—10 Ohms, ¼ Watt	(R28)
13938	Switch—Var. Osc. Coil Switch	(S1)
13990	Switch—Attenuator Switch	(S2)
13939	Switch—Modulation Control Switch	(S3)
13513	Switch—Power (On-Off) Switch	(S4)
3748	Fuse—½ Ampere	(S5)
7903	Jack—External Modulation	(J1)
13989	Shield—Fixed Osc. Coil Shield	
2682	Shield—Tube Shield	
3950	Shield—Tube Shield	
4629	Shield—Tube Shield Top	
4794	Socket—4-contact Radiotron Socket	
4786	Socket—6-contact Radiotron Socket	
4787	Socket—7-contact Radiotron Socket	
13973	Coil—Variable Osc. coil assem. 90-325—325-1000 KC	(L1, L2, L8, L9)
13977	Coil—Fixed Osc. Coil Assem.	(L3)
12477	Reactor	(L4)
13983	Reactor	(L5)
13978	Coil—R. F. Choke (Hammerlund Midget Code No. CH-X)	(L6)
13974	Coil—Variable Osc. coil assem. 1000-2500—2500-7000 KC	(L10, L11, L12, L13)
13975	Coil—Variable Osc. coil assem. 7000-14,500—14,500-32,000 KC	(L14, L15, L16, L17)
13976	Coil—Mounting Base Complete	
13979	Escutcheon Nameplate	
13980	Knob—Variable Cond. Knob	
7960	Knob—Controls	
13981	Knob—Variable cond. knob (Kurz-Kasch Cat. No. S-281-7AA-Black)	
4991	Lamp—Pilot lamp, 6.3 Volts	
3529	Lamp Socket	



Electronic Sweep Oscillator

Front View of Cathode-Ray Oscillograph No. 151 and 151A

Cathode-Ray Oscillograph

Stock No. 151 and 151A

IB-23357

Part III

OPERATING INSTRUCTIONS

WARNING — WHEN POWER IS ON, THERE IS A POTENTIAL OF 400 VOLTS FROM THE AMPLIFIER TUBE GRIDS TO GROUND. DISCONNECT POWER CORD BEFORE WITHDRAWING CHASSIS.

Introduction

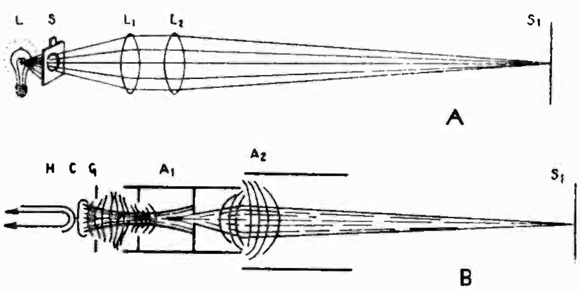
These instructions cover the installation, operation, maintenance and servicing of the No. 151 Cathode-Ray Oscillograph, designed especially for high-quality servicing of radio receiving sets and other communication devices. This Oscillograph provides a reliable instrument for the study of wave shapes, measurement of modulation, adjustment of radio receivers and transmitters, determination of peak voltages, and other similar applications. Its chief (although not the only) advantage over older types of measuring instruments is its freedom from inertia, allowing the observation of very rapid changes of current or voltage without appreciable distortion. The unit is entirely portable, the dimensions are approximately 9¼ inches high by 13¾ inches wide by 7¾ inches deep, and the weight is approximately 15 pounds. The illustration on the opposite page shows the general appearance of the instrument and the operating controls. It operates entirely from an a-c source of 110 volts, an integral power unit supplying all operating voltages required for operation of the equipment.

The purpose of these instructions is to give the fundamentals of operation. As the use of cathode-ray apparatus becomes more widespread many new applications will be found for this equipment so that a thorough understanding of these fundamentals will enable the operator to readily adapt the equipment to his particular use. Since the equipment is built around the cathode-ray tube, a discussion of cathode-ray tubes and images obtained follows, which serves to explain the operation of the equipment and aids in analyzing figures which appear on the screen. The operator is urged to read this section thoroughly so that the numerous applications of the equipment may be readily understood and also that optimum performance may be obtained at all times.

General Discussion of Cathode-Ray Tube

Fundamentally, a cathode-ray tube consists of (1) an electron-beam source, (2) provision for deflecting the beam, (3) provision for focusing the beam on a screen, and (4) a fluorescent screen for visibly indicating the position of the beam.

In the RCA-913 tube the electron source is a substantial cathode, indirectly heated. The cathode, control electrode (grid), and focusing electrodes constitute an electron gun, used to project a beam of electrons (Function 1). Two sets of electrostatic plates at right-angles to each other provide for deflection of the electron beam (Function 2). Focusing (Function 3) is accomplished by adjusting the ratio between the voltages on anodes No. 2 and No. 1. This ratio is in the neighborhood of 5:1. In practice, the anode No. 2 voltage is generally held constant and the anode No. 1 voltage is varied, since it is the smaller potential to control. The screen (Function 4) forms one end of the tube. It is one inch in diameter, and the inside is coated with material which emits light when struck by the electron beam. The control electrode (grid) constitutes a means of controlling the quantity of electrons admitted into the stream, and thus allows control of spot intensity (also called "brilliancy") —the more negatively the grid is biased, the fewer electrons in the beam, the smaller the spot, and the less the intensity.



"A"—Optical Analogy
"B"—Three Element Cathode Rays

Figure 3—Focusing Cathode Rays

The "Electron Gun" in the cathode-ray tube may be compared to a simple optical system as shown in Figure 3-A. In this diagram the light emitted from the lamp, "L," is focused on the screen, "S_1," by means of a double lens system, "L_1," "L_2," and the amount of light is controlled by the shutter, "S," which, when closed, shuts off the light completely. The brilliancy of the image on the screen depends on the size of opening in the shutter, "S," and the candle power or wattage of the lamp, "L." If the candle power of the lamp is fixed (that is if we select a lamp of a given wattage) then the brilliancy is solely controlled by the shutter, "S." The size or definition of the image on the screen, "S_1" is controlled by adjusting the position of the lenses, "L_1" and "L_2," to the correct distance, which is called focusing. If the position of the lens, "L_1," is fixed, then the focus will depend solely on the adjustment of the position of lens, "L_2." Furthermore, with both lenses, "L_1 and L_2," adjusted correctly, it would be possible to change the focus by actually substituting for the lens, "L_2," various lenses until the one having the correct index of refraction is obtained. This is essentially the method of controlling the focus in the cathode-ray tube.

Figure 3-B shows the elements constituting the "electron gun" previously mentioned. "C" is the cathode which radiates electrons when warmed by the heater, "H." The bias voltage of the grid "G" controls the number of electrons allowed to pass through it. The distance from the "gun" at which the electrons converge to a point, or "focus," is determined by the ratio of the voltages on the two anodes, "A_1 and A_2." Obviously, then, there is a particular ratio of these two voltages which will cause the beam to focus at the screen distance.

Figure 4 shows the addition of one pair of deflecting plates, "D_3 and D_4," to the previous figure. If these two plates are at the same potential, that is if no voltage difference exists between them, the electron stream is unaffected by their presence. However, if a difference of potential does exist be-

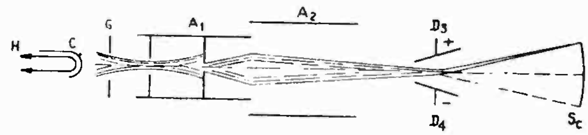


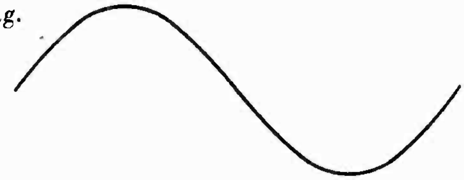
Figure 4—Deflection in One Direction

tween "D_3 and D_4," the electron stream will be deflected toward the plate which is more positive ("D_3" in the figure). (A positive charge attracts electrons, which are negative, while a negative charge repels. Both plates therefore bend the electron beam up as shown.) A similar pair of plates at right angles to the first pair would effect a deflection at right angles to the first deflection. By applying voltages of the proper value and polarity to each pair of plates the spot may be moved to any point on the screen. If an alternating voltage is applied to one pair of plates the spot will move in response thereto, the location of the spot at any instant of time resulting from the value of the voltage at that instant. If the voltage alternates more rapidly than about ten cycles per second, the retentivity of the screen and the observer's eye cause the spot to blend into a continuous line.

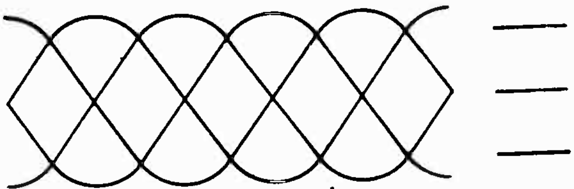
In the No. 151 Oscillograph there are controls (centering—V and H) for effecting permanent displacement of the spot by applying a direct voltage to the deflecting plates. They are intended to correct any accidental eccentricity of the cathode-ray spot itself, or as a means for centering those patterns (such as that obtained in I.F. amplifier alignment) having a greater deflection in one direction than in the other. These controls move the axis, or zero point about which the alternating voltage deflects the spot. Moving these controls simply transfers the whole pattern's physical position relative to the dimensions of the screen, and introduces no distortion, change in sensitivity, or other harmful effect.

In order to study the wave shape of any voltage causing a vertical deflection, it is necessary to move the spot horizontally too, so that the pattern may be spread out. Since a curve of voltage vs. time is usually desired, a circuit is incorporated giving a voltage having the unusual characteristic of a constant, steady rise to a maximum value and then a sudden drop to its starting value (a "saw tooth" shape). Under influence of this voltage the spot moves horizontally from one side of the tube to the other at a constant speed and then snaps back suddenly to its starting position. By this means the pattern on the end of the tube is made exactly the same as a curve of the unknown voltage vs. time, and the oscillograph operating in this manner may be considered an automatic plotting machine wherein the scales may be changed by merely setting the control knob. Examples of such curves are shown in Figure 5-11, wherein the unknown voltage (vertical) is a sine wave. The ratios shown

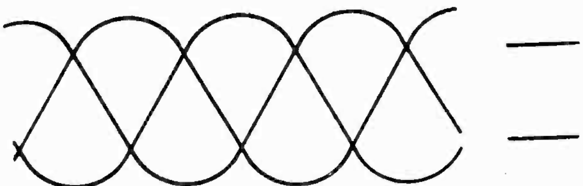
Fig.

5 

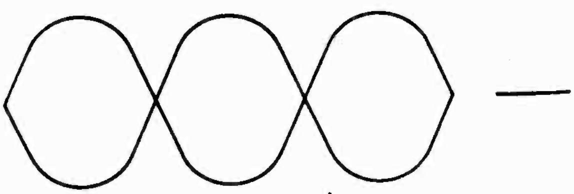
1:1

6 

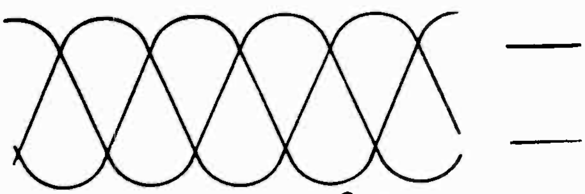
5.4 $1\frac{1}{4}:1$

7 

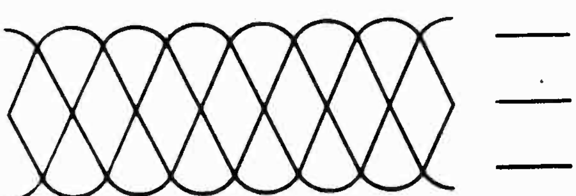
4:3 $1\frac{1}{3}:1$

8 

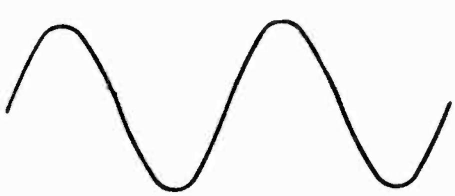
3:2 $1\frac{1}{2}:1$

9 

5:3 $1\frac{2}{3}:1$

10 

7:4 $1\frac{3}{4}:1$

11 

2:1

are the ratio of unknown voltage frequency to "saw tooth" oscillator frequency.

When sinusoidal alternating voltages are applied to both deflection axes, the resultant patterns are closed continuous lines known as Lissajous Figures. If the two frequencies are equal the pattern will be as shown in Figure 12 A-E depending of course upon the phase. If the two frequencies are very slightly different, the phase angle is continually changing and the pattern changes with it, passing through the whole series of shapes shown. Figure 12 F-J shows the patterns obtained when the horizontal frequency is twice the vertical frequency. Figures 13, 14, and 15 show the patterns obtained with the marked frequency ratios, the vertical frequency being the higher in each case. Whenever such a figure stands still, the two frequencies are in an exact ratio, any slight variation from such ratio being indicated by motion of the pattern.

In thinking of any of these patterns it must be remembered that the electrons strike only one point at a time, the apparent line being caused entirely by the retentivity or "holding over" of the screen and the human eye.

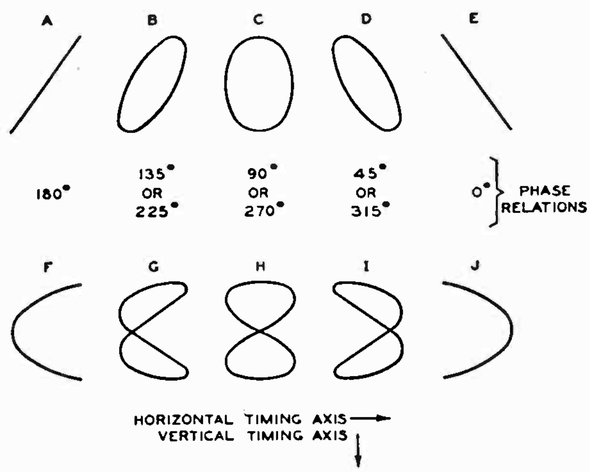
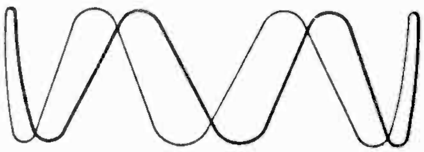


Figure 12

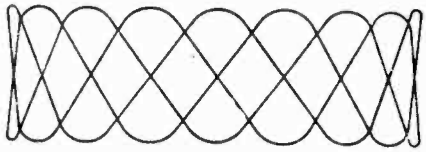
*Figures 5-11, inclusive, adapted from "The Cathode Ray Oscillograph in Radio Research," R. A. Watson Watt. Published by His Majesty's Stationery Office, London, England.

*Figures 12 to 15, inclusive, adapted from "Frequency Measurements with the Cathode Ray Oscillograph," Frederick J. Rasmussen, A. I. E. E. Transactions, November, 1926, Vol. XLV., Pages 1256-65.

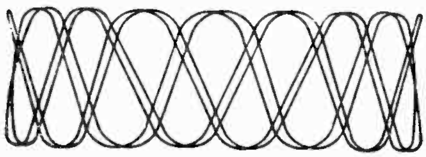
Fig. 13



14



15



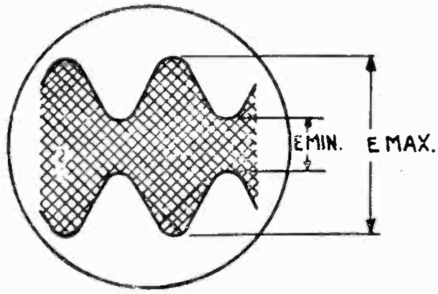
General Applications

The most universal method of employing a cathode-ray tube is to impress the voltage to be observed on the vertical deflecting plates and to impress a voltage varying linearly with time on the horizontal axis. The later voltage is usually obtained from an oscillator having a "saw-tooth" characteristic. The true wave form of the signal on the vertical axis can then be observed without distortion, since none is introduced by the horizontal signal source. The conventional procedure when observing recurrent phenomena is to operate the timing axis supply at a sub-multiple of the observed frequency, so that several complete cycles will appear on the screen. Since the image will drift across the screen unless the ratio of the two frequencies remains constant and of a certain value, it is usually desirable to synchronize the timing axis oscillator. For the observation of transient phenomena the timing axis supply frequency is, of course, not critical and synchronizing is often useless. In some cases, however, it is desirable to synchronize the start of the phenomenon with a timing axis impulse.

Although use of a linear timing axis is fairly general, there are quite a few applications of the tube which do not employ one. From the information on Lissajous Figures it can be seen that if a sine-wave source of known frequency is impressed on one axis, a variable-frequency source can be impressed on the other axis and calibrated at a number of points other than the known frequency. The phase shift in an electrical device can be observed by impressing the input on one axis and the output on the other axis. If there is 0 or 180-degree phase displacement in the unit, a sloping straight-line image will appear. Refer to Figure 12 (A to E). If the above electrical device happened to be a frequency doubler, Figures 12F to 12J would apply.

The vertical set of deflecting plates can be used as a peak voltmeter. The impedance can be made very high, and the input capacitance very low, so that the voltmeter will show no discrimination between d-c and reasonably high radio frequencies. Transients can be observed almost as effectively with a sine-wave timing axis supply as with a linear one, as in this case the supply functions purely as a "spreader."

In order to illustrate the flexibility of such apparatus, a desired measurement will be assumed and several methods of obtaining the unknown quantity outlined. An r-f oscillator is being modulated an unknown amount with a 1,000-cycle tone, and it is desired to determine the percentage modulation. One method is to observe the modulated r-f envelope by impressing either a sine-wave or linear supply on the horizontal axis and impressing the modulated r-f signal on the vertical axis. Figure 16 shows this method graphically. Incidentally, if a linear timing axis is used, as shown, the true wave-shape of the envelope will appear, and an appreciable lack of symmetry or other irregularities will be immediately apparent, indicating distortion. If no timing axis voltage is used, the percentage can be determined as shown at Figure 17. This obviously necessitates removal of modulation. A third method is shown at Figure 18. The 1,000-cycle audio voltage which is modulating the r-f signal is impressed on the horizontal axis (modulated r-f remains on vertical). A trapezoid results which allows ready measurement of the peak deflections. Symmetry of modulation can be checked with methods of Figures 16 or 18 by removing modulation from the r-f oscillator and noting whether the



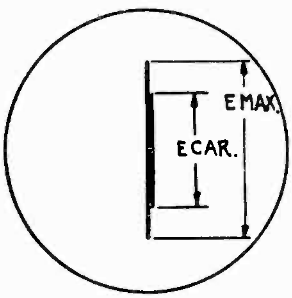
R. F. Modulated at 1,000 Cycles
Timing Axis Supply: 500-Cycle Saw-Tooth

$$\text{Percent Modulation} = \frac{\text{EMax.} - \text{EMin.}}{\text{EMax.} + \text{EMin.}} \times 100$$

Figure 16

carrier height is mid-way between the positive and negative modulated heights.

Another application of the cathode-ray tube is as a "visual" or curve-tracing device. This consists of an r-f oscillator being varied at an audio rate between two extremes of frequency, a means of displacing the indicating device horizontally in synchronism with the change of radio frequency, and a means of obtaining vertical deflection of the indicating device proportional to the output of the unit whose performance is to be observed. Usually, a condenser is arranged so that it "sweeps" the frequency of the r-f (test) oscillator continually, and at the same time an impulse generator, driven in synchronism with the "sweep" condenser varies an oscillator providing horizontal displacement of the indicating device in synchronism with the "sweep" condenser. (The No. 150 Oscillator performs all these functions simultaneously.) Perhaps the greatest use of such a device is for the alignment of the intermediate frequency stages of superheterodyne receivers. A frequency-response curve of the circuit under test is continually before the aligner, which allows rapid and very accurate adjustment of the stage in question. The greatest advantage from such a system is realized when the circuit to be aligned has sufficiently greater than critical coupling to give a flat-topped or double-peaked response. The same result can eventually be obtained by manually plotting a curve each time an adjustment on the unknown is made. However, this latter method is very laborious and requires considerable time.



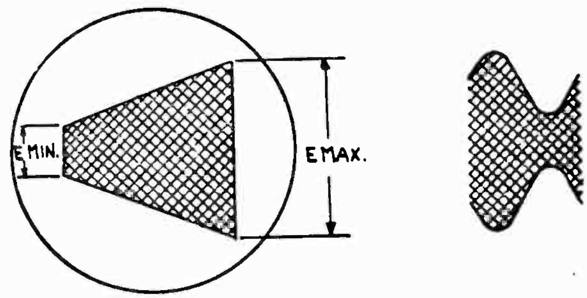
Timing Axis Supply—None

$$\text{Percent Modulation} = \frac{\text{EMax.} - \text{ECar.}}{\text{ECar.}} \times 100$$

Figure 17

A rather new development in such "visual" equipment has been made. The system dispenses with the conventional electrical or mechanical shutter and instead of employing one series of curves corresponding to a sweep through the r-f range in one direction, it employs two series of curves, one corresponding to an r-f sweep in one direction, and the other to an r-f sweep in the reverse direction. In other words, two curves (except in one case to be described later), appear on the screen, and the side of the screen which represents high frequency on one curve represents low frequency on the other. If on the first, third, fifth, ..."saw-tooth" pulses the left side of the screen represents low frequency, then on the second, fourth, sixth ....pulses the left side represents high frequency. There is only one point on the screen which represents the same frequency on every "saw-tooth" pulse. This point is the calibration point. All other points on the screen represent two frequencies, one above and one below the calibrating frequency.

When a circuit is incorrectly aligned it is not symmetrical about the calibrating frequency; that is, its response at 1 KC. above the calibrating frequency is not the same as the response at 1 KC. below. Since any point on the cathode-ray screen (except the calibrating point) represents two frequencies equally spaced above and below the calibrating frequency, there must appear two curves, one representing the circuit's response to high frequencies and the other the response to low frequencies. The gain characteristic of such a circuit and the resultant cathode-ray trace are shown in Figure 19A and B.



Timing Axis Supply—The Modulating Signal

$$\text{Percent Modulation} = \frac{\text{EMax.} - \text{EMin.}}{\text{EMax.} + \text{EMin.}} \times 100$$

Figure 18

If the circuit be properly aligned, its response curve will be symmetrical about the calibrating frequency; that is, its response at a number of kilocycles above the calibrating frequency is the same as its response at the same number of kilocycles below. Since the responses are equal the heights of the two curves will be equal, the curves will be superimposed and appear as one. The circuit of Figure 19, after being properly aligned, gives the response curve and cathode-ray trace shown in Figure 20A and B.

The chief advantages of the "double-image" over the conventional method are:

1. The superposition or "folding back" of the high- and low-frequency sides makes symmetrical adjustments easy and very accurate.

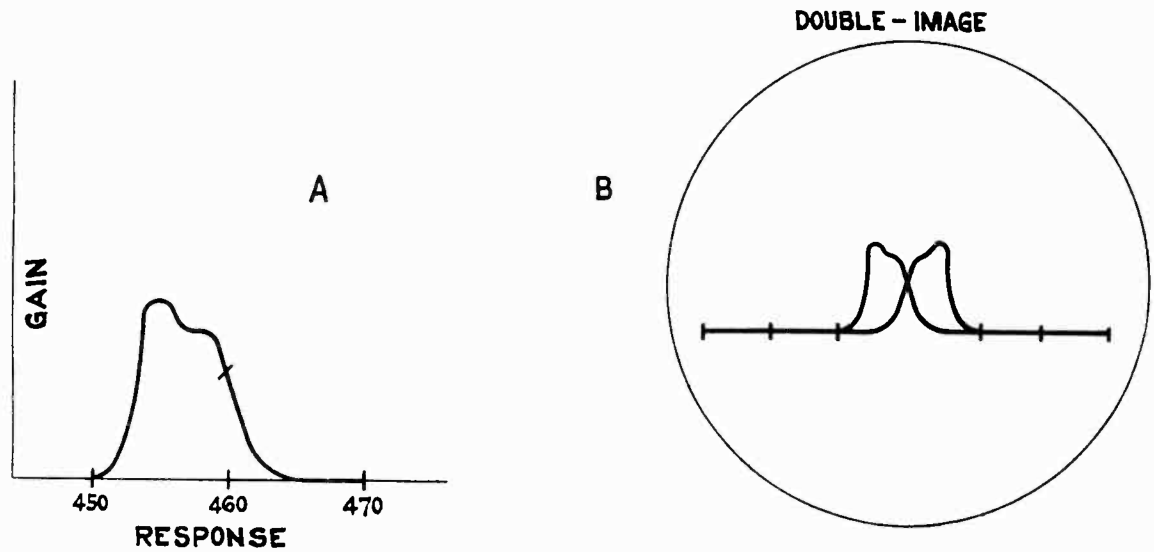


Figure 19

2. The probability of frequency error in aligning is reduced to less than half. For a given frequency error the separation between the two curves of the "double-image" method is twice the displacement of the one curve of the conventional method. Also any small error is much more obvious with two images on the screen.
3. The necessity of employing an electrical or mechanical shutter is eliminated.
4. Distortion in the detector or audio amplifier does not cause error in aligning. If appreciable audio distortion is present, the images on the screen will not be true response curves of the tuned circuit. Nevertheless, the actual response is still truly symmetrical when the two curves are made to completely coincide.
5. The necessity of marking a vertical reference line on the screen for use in frequency calibration and alignment is avoided.
6. The advantage (4) above further allows frequency calibration of the variable frequency oscillator by zero-beating with a standard-frequency oscillator, *without* regard to displacement of the curve by any audio distortion.

Alignment of the radio frequency stages of receivers can be made using the same method discussed above for i-f alignment. The single-frequency source and output meter method may be used, if desired, but from the standpoint of demonstrating the performance of the r-f stages or explaining their operation, the oscillographic method is preferable.

Installation

Unpack the instrument from the shipping container and remove the screws securing the front panel to the case. Withdraw the chassis from the case, supporting the panel at the bottom, and feeding the power cable through the hole in the back. Make certain that all tubes are firmly in their sockets and all grid cap connections are in place. Should the deflecting plates in the cathode-ray tube not be in the proper plane it will be necessary to twist the tube to its proper position. However, do not correct its position with the set in operation.

Next replace the chassis in the case and replace the securing screws. With "Intensity" control in extreme counter-clockwise position ("Off"), plug the power supply cable into an electrical outlet supplying 110-120 volt, AC supply. The instrument is then ready for operation.

NOTE: DO NOT ATTEMPT TO OPERATE THE EQUIPMENT WHEN WITHDRAWN FROM THE CASE AS THE HIGH POTENTIALS USED ARE DANGEROUS.

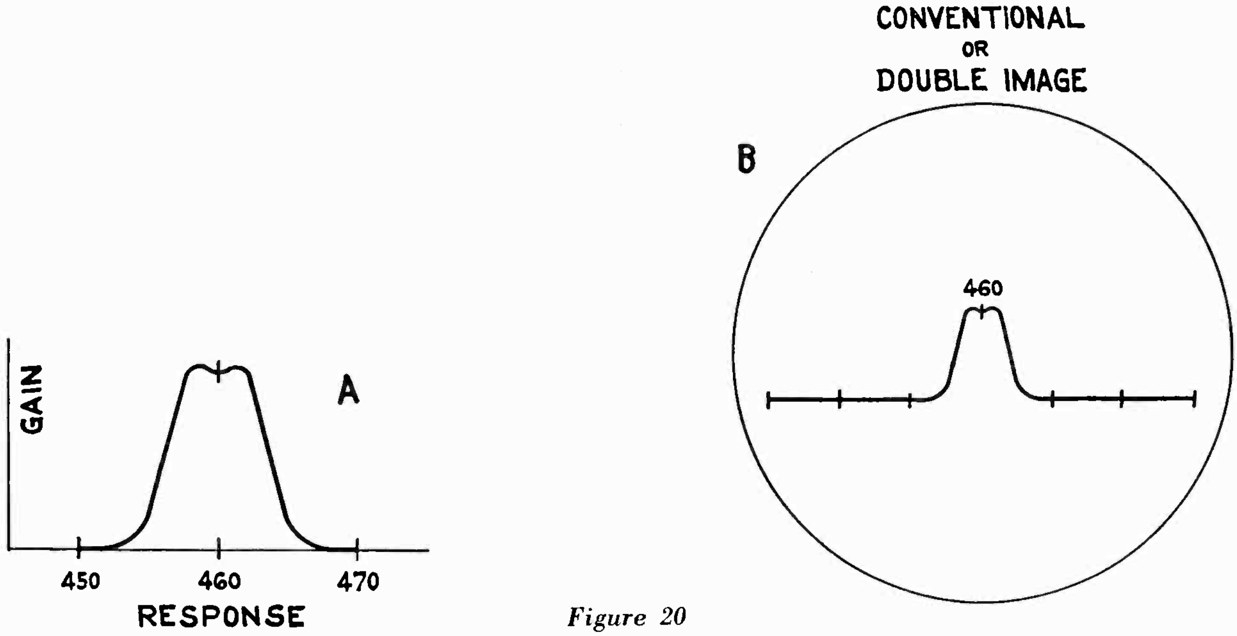


Figure 20

Operation

Controls

(Refer to the Schematic and Wiring Diagrams, Figures 21 and 22, for location of circuit units designated by symbols.)

1. "Intensity" control, R-23, is a potentiometer in the high side of the bleeder. Its position controls the bias on the grid of the cathode-ray tube, which in turn determines the quantity of electrons emanating from the "gun," thus controlling spot size. The power switch S_4 is located on this potentiometer. Initial clockwise rotation of this control turns on the power; additional rotation increases the spot intensity.

2. "Focus" control, R-21, is a potentiometer in the bleeder. Its position controls the anode No. 1 voltage, which (with constant A_2 voltage) determines the distance at which the electron beam focuses. In general, for a given "Intensity" setting, the "Focus" control should be set for maximum distinctness of spot or image.

3. "Ampl. V" switch, S_1, connects the "Vertical" binding posts either straight through to the vertical deflecting plates on the cathode-ray tube or through an amplifier to these deflecting plates. In either case there is a condenser in the input circuit.

4. "Ampl. H" switch, S_2, has two positions: "Timing" and "On." On "Timing" the "saw-tooth" or timing axis oscillator feeds through an amplifier to the horizontal deflecting plates on the cathode-ray tube and the "Horizontal" binding post is the synchronizing input terminal. When "On" the "Horizontal" binding post is connected through an amplifier to these deflecting plates.

5. "Ampl. V Gain" control, R_1, is a potentiometer on the input circuit of the vertical amplifier. With "Amplifier V" switch "On," this potentiometer controls the vertical deflection.

6. "Ampl. H Gain" control, R_7, is a potentiometer on the input circuit of the horizontal amplifier. With "Amplifier H" switch on "Timing" or "On" this potentiometer controls the horizontal deflection. Due to the capacity load on this input potentiometer, when operating on "Timing" at the higher audio frequencies, linear sweep will not be obtained at all settings of this control.

7. "Range" switch, S_3, selects one of six timing capacitor values. It thus changes the timing axis oscillator frequency in steps giving six ranges approximately as follows: No. 1, 20-130; No. 2, 50-300; No. 3, 100-900; No. 4, 350-3,000; No. 5, 1,100-10,000, and No. 6, 3,000-12,000 cycles.

8. "Freq." control, R_{13}, is a rheostat in series with the timing condenser. It changes the timing axis oscillator frequency gradually as it is rotated, and in conjunction with "Range" switch above gives continuous range between the extremes of frequency.

9. "Sync." control, R_{11}, is a potentiometer controlling the amount of synchronizing voltage fed to the grid of the RCA-885 tube. In general it should be set as far counterclockwise as is consistent with a locked image, as oversynchronization causes poor wave-form from the timing axis oscillator.

10. "Centering V and H" are potentiometers to control the amount of d-c potential between the two deflecting plates of each pair, and thereby allow adjustment of the position of the spot or image.

11. There are two pairs of binding posts labeled "Vert. High," "Gnd. 0," "Horiz. High," and "Sync. High." As indicated by the word "High" on the posts, the Vert., Horiz., and Sync. posts all connect to internal circuits, the only ground posts being marked "Gnd. 0." To connect to the vertical amplifier, connect to Vert. and Gnd. To connect to the horizontal amplifier, connect to Horiz. and Gnd. To connect to the synchronizing circuit, connect to Horiz. and Gnd. The Horiz. binding post is controlled by the "Amp. H" switch so that when the switch is "On" the post connects to the amplifier input and when the switch is on "Timing" the post connects to the synchronizing circuit. The Sync. post carries a fraction of the amplified vertical voltage and is to be connected to the "Horiz." post whenever it is desired to synchronize on the signal being examined.

Applications

GENERAL. The following procedures are included in order to familiarize the operator with the operations and connections involved in the particular applications. All applications of the equipment are not described, but analysis of the particular problem involved will show wherein it is similar to or differs from those given, enabling the operator to work out his own sequence of operation.

As has been previously pointed out, most applications of this instrument are carried out with the output of the unit under test connected to the vertical plates of the cathode-ray tube, and the waveshape studied by application of known constants on the horizontal plates of the tube. Before any measurements are attempted, the operator is urged to go through the following procedure in order to familiarize himself with the controls and their location and to get the "feel" of their operation:

1. Connect the power plug to an a-c source of 110 volts. Turn "Intensity" control clockwise, causing a spot to appear on the screen, increasing in size as the "Intensity" control is advanced further clockwise. The "Focus" control should then be adjusted until maximum distinctness of spot or image occurs.

CAUTION. DO NOT ALLOW A SMALL SPOT OF HIGH BRILLIANCY TO REMAIN STATIONARY ON THE SCREEN FOR ANY LENGTH OF TIME, AS DISCOLORATION OR BURNING OF THE SCREEN WILL RESULT.

With the spot on the screen and with the "Intensity" control retarded so that the spot is not too brilliant, adjust the position of the spot to the center of the screen by rotation of the two centering controls.

To turn the equipment off, turn "Intensity" control to its extreme counter-clockwise position, until a distinct "snap" is heard.

2. Apply a source of 60-cycle current to the "Vertical" binding posts. To adjust the length of the resultant line appearing on the screen turn "Ampl. V" switch "On" and adjust "Ampl. V Gain" control until the length is as desired. Application of the same 60-cycle source to the "Horizontal" binding posts with "Ampl. H" switch "On" will similarly show a horizontal line on the screen, the length of which may be varied by manipulation of "Ampl. H Gain" control.

3. To expand (2) further, have 60 cycles available at both "Horizontal" and "Vertical" terminals.

Apply the horizontal 60-cycle supply on the screen through "Ampl. H" and its gain control, then apply the 60-cycle vertical supply through "Ampl. V" and its gain control. The result will be a straight line. (See Figure 12.)

AC VOLTMETER WITHOUT AMPLIFIER—For this application, the characteristics of the unit are as follows: Input resistance—2 megohms; input capacity—approximately 40 mmf.; voltage range—85 r-m-s volts (higher with external attenuator); calibration—approximately 250 peak-to-peak volts per inch or 85 r-m-s volts per inch. Insulated for 200 volts d.c.

Procedure — Make connections to the Oscillograph and turn controls to the positions specified in Application No. 6 on the enclosed operating chart. Measure or estimate the length of line appearing on the screen in inches (depending on accuracy desired) and multiply by 250. This gives the approximate peak-to-peak value of the unknown voltage. For approximate effective value, if voltage being measured is sinusoidal, divide peak value by 2.8.

AC VOLTMETER WITH AMPLIFIER—For this application, the characteristics of the unit are as follows: Input resistance—1 megohm; input capacity—approximately 30 mmf.; frequency range—20-10,000 cycles; maximum voltage—500 volts (higher with external attenuator); calibration—(roughly) 5 peak-to-peak volts per inch, or 2 r-m-s volts per inch. Insulated for 100 volts d.c.

Procedure — Make connections and adjust controls according to Application No. 7 on the chart. With "Ampl. V Gain" control in the extreme clockwise position a line one inch long is obtained on the screen for about 2 volts r-m-s input. Intermediate positions of the gain control give different calibrations, of course, and if considerable use is made of this feature it may be advisable to plot a curve of the inputs required to give a one-inch deflection at various intermediate positions of the gain control.

A particular application of operation as an a-c voltmeter is in making hum measurements in a power supply unit. In this case the "O" binding post ("Vertical") is connected to the common lead of the filter circuit of the unit under test and a clip lead, connected to the "High" binding post, is used to check the a-c ripple present at the various circuit component terminals. When the direct potential exceeds 100 volts it will be necessary to add a capacitor of .1 to .5 mfd. in series, and a 1 megohm leak across the input terminals, to prevent damage due to high direct potentials on the input condenser.

AUDIO QUALITY MEASUREMENTS — Use of the "saw-tooth oscillator" feature of the Oscillograph provides a check which cannot be made with an ordinary voltmeter. This is extremely helpful in discovering the audio quality of a receiver or similar instrument and also in locating causes of audio distortion.

Procedure — Apply the output from a constant frequency record or audio oscillator to the "Vertical" binding posts, with controls set as in Application No. 8. Turn "Range" switch to that tap giving a range including the frequency of the input signal and adjust "Freq." control until the sawtooth oscillator frequency is near that of the input signal. If the two frequencies are identical, one cycle of the input signal will be observed on the screen; if the saw-tooth oscillator frequency is one-half that of the input signal, two cycles of the latter will appear; if one-third, three cycles; etc. Next, connect this constant frequency record or audio oscillator output to the audio input of the unit under test and connect the output of the unit under test to the "Vertical" binding posts of the Oscillograph, all adjustments of which are as previously set. If the resultant wave does not correspond to that obtained when the input was direct to the Oscillograph, audio distortion is present.

If it is desired to measure the overall audio fidelity of a receiver, for instance, the procedure is similar to that above except that the voltage modulating an r-f oscillator is fed into the Oscillograph, adjusted as above. Then the modulated oscillator is connected to the r-f input terminals of the receiver and the loudspeaker voice coil connected to the Oscillograph. Comparison of the two resultant waves will indicate how much distortion occurs in the receiver under test. Observing the quality of the input to the receiver from the test oscillator will also show how much distortion is being fed into the receiver from the test oscillator. This is desirable, since it may show that all the distortion present in the receiver output may not be due to the receiver characteristics, but to those of the test oscillator.

Modulation Indicator — (1) One method of measuring the modulation of a transmitter is to place the modulated r-f output of the transmitter into the vertical plates of the cathode-ray tube and the audio input signal to the transmitter on the horizontal plates of the tube through the synchronizing circuit.

Procedure — Connect a constant frequency input to the transmitter and connect a small pickup coil, located near the transmitter tank coil, to the "Vertical" binding posts. The pickup on this coil should be from 50-75 volts. Connect the "Horiz." binding post of the Oscillograph to transmitter audio amplifier at a point providing a 2–4-volt signal at low impedance. Turn controls to positions given in Application No. 9 on the chart. Turn "Range" switch to tap including the frequency of the input signal and adjust "Freq." control until the saw-tooth oscillator interlocks with the signal on the vertical plates. Adjustment of the "Sync." control provides control of the voltage to the grid of the RCA-885 tube. Adjustment of "Ampl. H Gain" control varies the horizontal deflection.

(2) Another, somewhat similar, method of modulation measurement is to connect the pickup coil to the "Vertical" binding posts as before, and connect the audio signal (from the transmitter audio amplifier) to the "Horizontal" binding posts. Turn controls to positions given in the chart for Application No. 10. Adjust "Ampl. H Gain" control until desired horizontal deflection is obtained. The percentage modulation can then be readily determined. (See Figure 18.)

Alignment of Intermediate Frequency Stages —For alignment of the intermediate frequency stages of a receiver it is essential that an auxiliary apparatus be available to sweep the intermediate frequency for which the receiver is designed. The Type TMV-128-A Frequency Modulator is designed for this use. It consists of sweep condenser and a synchronizing generator rotated in synchronism by a driving motor. The condenser is arranged to "sweep" the frequency of the r-f input to the receiver (or i-f stages) and the synchronizing generator connects to the "Horiz." binding post of the Oscillograph so as to synchronize the saw-tooth oscillator with the frequency variation of the test oscillator (such as the TMV-97-C) input to the receiver. A switch on the panel of the Modulator provides two ranges of capacity for "sweeping" the test oscillator output frequency; on "Hi" the range is 20-65 mmf., and on "Lo" the range is 15-35 mmf.

The No. 150 Oscillator takes the place of both of these units, performing all the necessary functions without moving parts.

The test oscillator output should be coupled to the grid of the tube preceding the i-f stage under alignment. It is essential that this connection be made without altering any of the operating characteristics of this stage. If the grid of the tube to which connection is to be made is at zero d-c potential with respect to ground, connect the oscillator to the grid of the tube and disconnect the lead normally on the grid, the low side of the test oscillator output returning to chassis ground. If the grid is not at zero d-c potential with respect to ground, connect the high side of the oscillator to the grid (disconnecting the lead on the grid) and the other side to the "—C" lead for this grid.

The "Vertical" binding posts of the Oscillograph should be connected to the audio output of the second detector. For a diode detector this connection may be across the volume control alone or across both the volume control and automatic volume control resistor, if this connection is convenient. When the second detector is a triode, tetrode or pentode, resistance-coupled to the first audio stage, the connection to the "High" binding post may be to the plate of the tube, the "O" post being connected to ground. In the case of a triode, tetrode or pentode, transformer or impedance-coupled to the first audio stage, connect a resistor of approximately 20,000 ohms in series with the plate of the tube and by-pass the inductance in the plate circuit by a 1.0 mfd. or larger capacitor. This changes the impedance of the plate circuit to resistance rather than inductive reactance; the "High" binding post should be connected to the plate of the tube and the "O" post to ground in order to take the audio voltage off this resistor.

Procedure —Connect the test oscillator output to the grid of the tube preceding the i-f transformer being aligned, and connect the "Vertical" binding posts in the second detector as previously explained. The test oscillator should be set at the i-f alignment frequency with modulation "On."

Turn Intensity-control "On," adjust "Focus" properly, turn "Ampl. V" switch "On" and adjust the gain control. Turn "Ampl. H" switch on "Timing." Adjust the i-f transformer trimmers for maximum output; *i. e.*, peak them as much as possible. Remove the modulation on the test oscillator, connect the sweep condenser to the r-f oscillator and connect the synchronizing generator to the "Horiz." binding post. Turn motor "On" and readjust the frequency of the test oscillator until the forward and reverse waves show on the screen of the tube. Raise the frequency of the test oscillator until the highest points of the two waves coincide. (This readjustment is necessary to compensate for the added capacity of the cable and one-half of the sweep condenser capacity when the TMV-97C Test Oscillator, TMV-128 Frequency Modulator are used. This whole preliminary adjustment is unnecessary with the No. 150 Frequency Modulated Oscillator.) Record the dial setting of the oscillator for future reference. Adjust the trimmer condensers of the primary and secondary of the i-f transformer until the two curves coincide throughout their entire length. When this occurs, the stage is symmetrical with respect to the i-f frequency. During i-f alignment, the receiver tuning dial should be set at a point where variation of its position has no effect on the resultant curve. If this point cannot be found, short-circuit the grid or plate coil of the receiver r-f oscillator. The i-f stages should be aligned in order, starting at the last stage and working toward the first detector.

Frequency Measurements—In using the Oscillograph for frequency measurement, either Lissajou figures (sine waves on both axes) may be used, or the linear timing axis may be employed on the horizontal axis. The frequency stability of the saw-tooth oscillator running free is not good enough to depend on for accurate measurements, but when this oscillator is synchronized with a standard-frequency voltage its frequency stability is the same as that of the standard, and it can be synchronized at any sub-multiple of the standard frequency down to about one tenth. This allows convenient calibration of a device at many points between one-hundredth of—and ten times a single standard-frequency source, and every point is as accurate as the standard. If a 1,000-cycle standard source is used, calibration points between 10 and 10,000 cycles are easily obtained. Using Lissajou figures, calibration points between 100 and 10,000 cycles can be obtained. A frequency standard which is almost universally available is the 60-cycle a-c supply. Since the advent and rapid spread of electric clocks the frequency of nearly all commercial power is held to a very close tolerance. When synchronizing on 60 cycles, the saw-tooth oscillator can be locked at 30 or 60 cycles, as desired. This allows accurate calibration at frequencies up to about 600 cycles. Refer to Application No. 13 on the chart.

Checking Phase Shift—To check phase shift of a device with the Oscillograph, set controls as shown on Application No. 12 on enclosed chart, observing the screen pattern with input to device on "Horizontal" binding posts and output from device on "Vertical." If no phase shift exists, a sloping straight-line image will appear.

Part IV
SERVICE DATA

Electrical Specifications

Power Supply Rating	Voltage	110–120 Volts AC
	Frequency (Stock No. 151)	50–60 Cycles
	(Stock No. 151A)	25–60 Cycles
	Wattage Consumption	35 Watts
	Fuse Protection	1 Amp.
Operating Limits	Deflection sensitivity at amplifier inputs	5 peak-to-peak volts per inch (max. "gain.") or 1.75 volts (RMS)
	Deflection sensitivity at cathode-ray tube inputs	250 peak-to-peak-volts per inch
	Input Characteristics:	
	(1) With amplifier	1 megohm, approximately 30 mmfd.
	(2) Without amplifier	2 megohms, approximately 40 mmfd.
	Frequency response range of amplifiers	20–15,000 Cycles
	Maximum signal input (with amplifier)	500 Volts (RMS)
	Frequency range of timing axis	30–10,000 Cycles
	Maximum d-c voltage across input binding posts.	100 Volts with amplifiers 200 Volts direct
Radiotrons Used and Functions	1 RCA-6C6	Signal amplifier for vertical deflection
	1 RCA-6C6	Signal amplifier for horizontal deflection
	1 RCA-885	"Saw-tooth" oscillator
	1 RCA-913	Cathode-ray tube (1-inch)
	1 RCA-80	Full-wave rectifier

Physical Specifications

Overall Dimensions	Height (including carrying-handle)	$9\frac{1}{4}$ inches
	Width	$13\frac{3}{4}$ inches
	Depth	$7\frac{3}{4}$ inches
Weight: 60 cycle		$14\frac{1}{2}$ pounds
25 cycle		16 pounds

Circuit Description

The schematic arrangement of the entire circuit is shown in Figure 21.

There is one usual feature to this circuit that causes surprising voltage distributions but doesn't affect the operating theory. Since the shell of the cathode-ray tube is connected to the second anode, which must be at a positive potential from the cathode, and since the shell must be grounded for safety, the positive side of the power supply has been connected to ground. This is common practice in Cathode-Ray Oscillographs, but in this case the power supply is common to the oscillograph and amplifier tubes, so the cathode, grid, suppressor and screen grids of the amplifiers are all at a high potential to ground and the plate is nearly at ground. It may be argued that no improvement has been made since the grid clips are at high voltage, but the grid clips cannot be reached when the equipment is in the case, and the resistance of the circuit is sufficiently high to limit the current to safe values at all but very low settings of the gain control.

While the voltage distribution, as shown in Figure 24 is quite unusual, the method of operating the amplifier tubes has not been affected. The grids are maintained about two volts negative from the cathode, the suppressor is connected to the cathode, the screen grid is about 35 volts positive from the cathode and the plate still more positive.

An amplifier consisting of a single RCA-6C6 constitutes the means of obtaining "gain" for the signal applied to the vertical deflecting system. The input to this stage is a high-resistance potentiometer connected to provide "gain" control. An isolation capacitor is made a part of the input circuit to exclude any d-c which may be associated

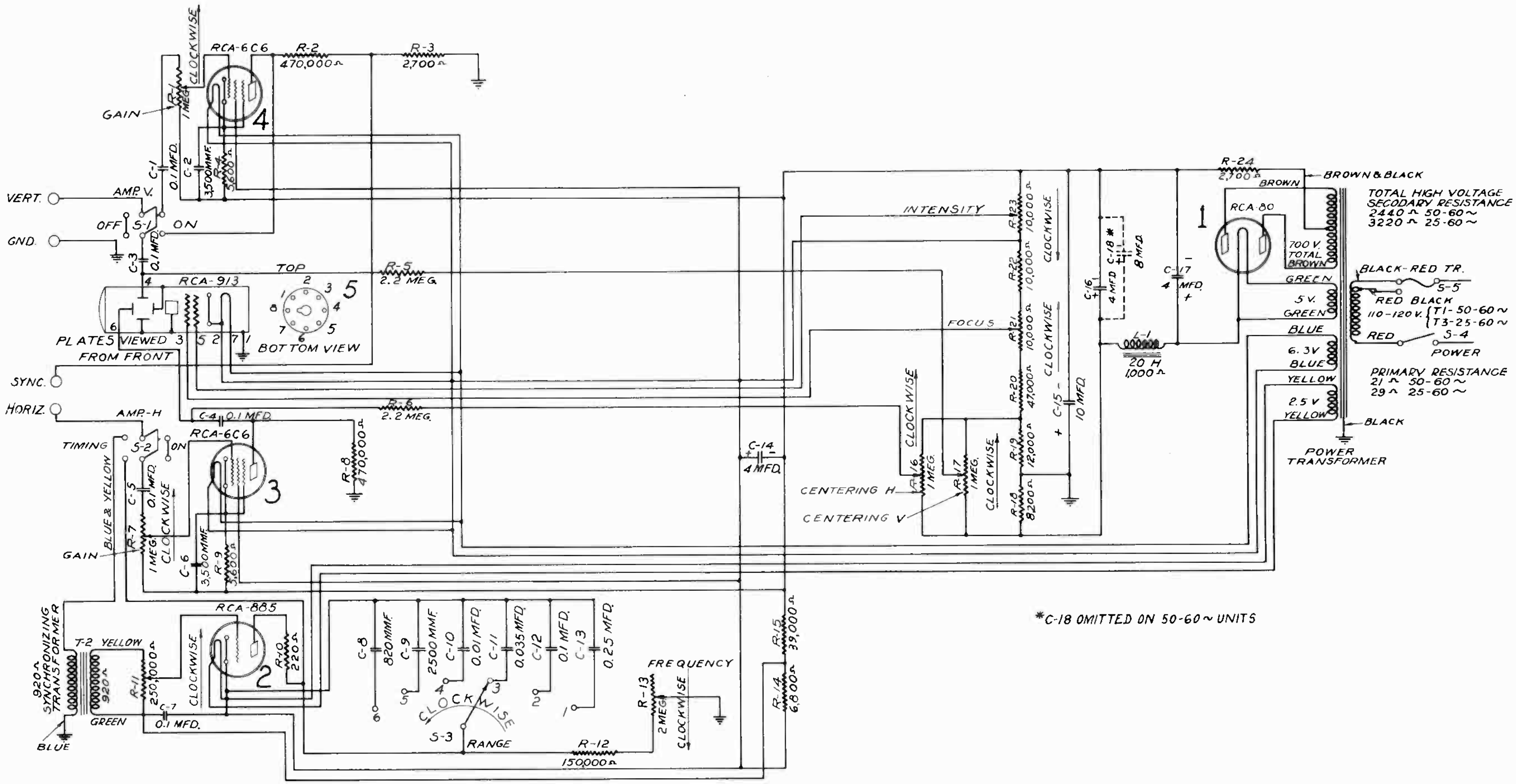


Figure 21—Schematic Diagram (Stock No. 151 and 151A) T-611032

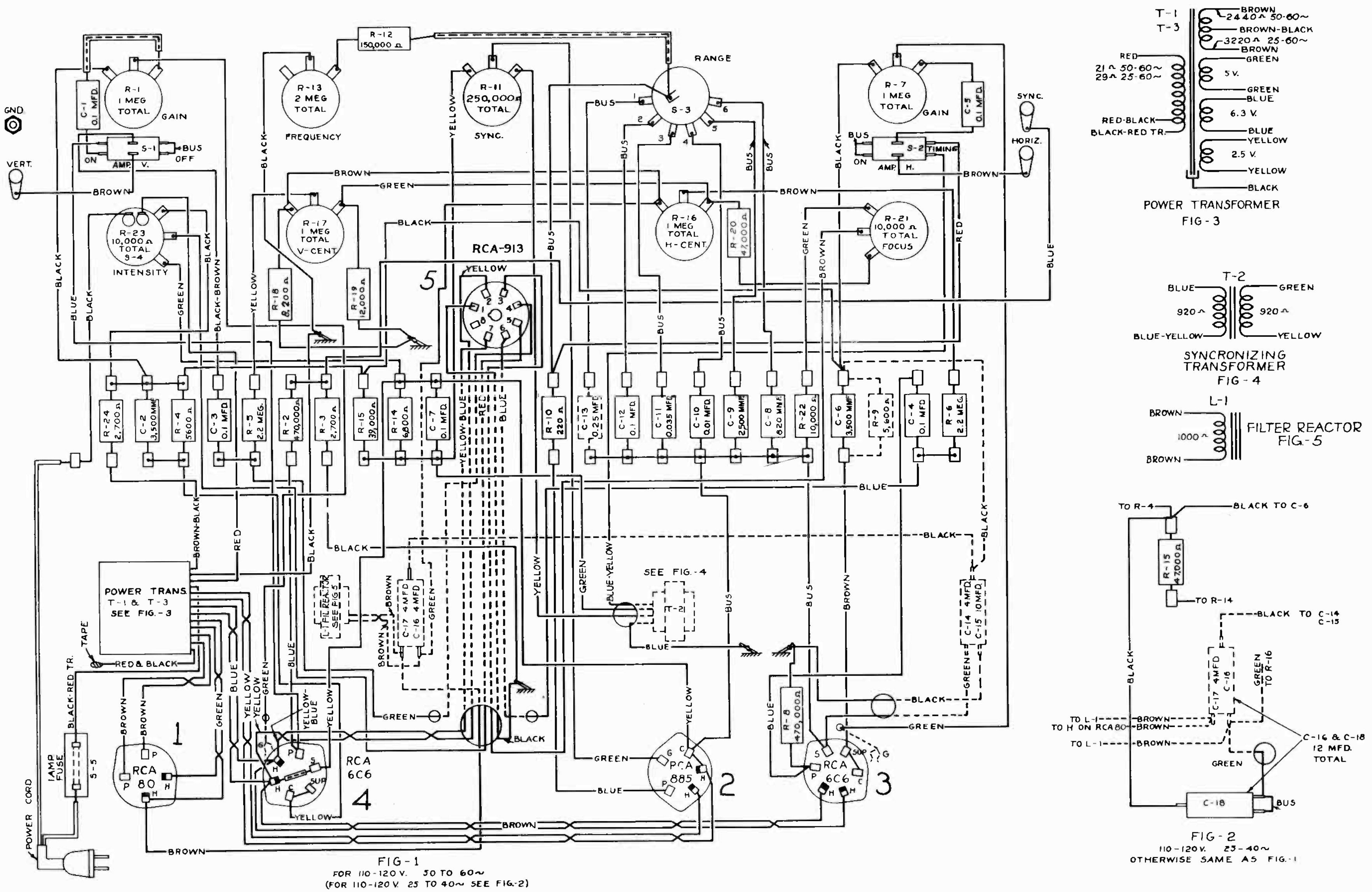


Figure 22—Connection Diagram (Stock No. 151 and 151A) T-611033

with the circuit being observed. The plate, or output circuit of the RCA-6C6 is a resistor whose value is so designed as to effect a broad and uniform frequency response in the amplifier stage. Coupling from the amplifier plate to the cathode-ray tube is made through a capacitor.

The amplifier for the signal applied to the horizontal deflecting plates is identical to that described above. A switch is provided to disconnect the vertical amplifier, thereby applying the voltage to be studied directly to the deflecting plates. There is an input switch to the horizontal amplifier for feeding in the timing or "saw-tooth" oscillator signal.

A synchronization system is included, as shown in the input circuit of the RCA-885. This is the "Synchronizing" circuit described under "Operation." The timing axis oscillator stage, using the RCA-885, is designed to have a frequency range of 30-10,000 cycles, controlled through the "Range" switch and "Frequency" control. The signal from this oscillator has a "saw-tooth" wave-shape, obtained as follows: A d-c potential is applied across a capacitor and resistor in series in the plate circuit of the RCA-885 tube. This voltage charges the capacitor until the ionization potential (plate voltage at which the gas in the RCA-885 ionizes) is reached. When the RCA-885 ionizes the capacitor is short-circuited and the voltage across it drops nearly to zero. The RCA-885 immediately deionizes and allows the capacitor to start charging again. In this manner, the voltage across the capacitor has a "saw-tooth" characteristic. The capacitor referred to above is selected by the position of the "Range" switch as described in "Operation." With "Ampl. H" switch on "Timing," the voltage across this capacitor passes through the horizontal amplifier to the plates of the RCA-913.

Power required for operation of the instrument is obtained through the power unit from a 110–120-volt, AC supply. Voltage rectification is accomplished by an RCA-80 connected in the secondary windings of the power transformer.

Maintenance

(1) Radiotrons

Under ordinary usage within the ratings specified for voltage supply, tube life will be consistent with that obtained in other applications. The rectifier, oscillator, and amplifier tubes will wear in accordance with loss of emission; whereas the determining factor in the life of the RCA-913 cathode-ray tube is the deterioration of the fluorescent screen. It is therefore advisable to avoid leaving a bright, concentrated "spot" on the screen.

It is not ordinarily possible to test the Radiotrons in their respective sockets, due to the likelihood of circuit effects causing error. Their removal and check with standard tube-testing apparatus is therefore desirable. Replacement of the questionable tube with one known to be in good condition, is another acceptable and definite means of tracing tube troubles.

To remove the RCA-913, it is necessary to slide the tube toward the back of the chassis, then snap the tube out of its clip. Replacement is the reverse operation, sliding the tube into the panel opening.

(2) Fuse Replacements

A small 1-ampere cartridge fuse is used in the primary circuit of the power transformer. This fuse is intended for protection of the entire power system of the Oscillograph, and should, therefore, not be replaced by one having a higher rating, nor be shorted out. A fuse failure should be carefully investigated before making a replacement, as usually in the use of fuses of accepted quality, there must be a definite cause for the fuse breakdown. The cause may originate from a surge in the power-supply line, but the greater percentage of causes may be centered in the apparatus protected, such as shorted rectifier elements, and so forth.

(3) Resistance and Continuity Tests

The schematic circuit is shown in Figure 21, and the actual wiring layout giving color code and physical relation of the parts is shown in the chassis wiring diagram, Figure 22. All resistor and capacitor values are given to facilitate a rapid and sure test for continuity of circuit and the condition of same. Coils and transformer windings have their d-c resistances shown.

In working on the chassis of the Oscillograph, care must be observed to have the power supply completely disconnected. The high voltages associated with the circuits of the cathode-ray tube make it dangerous to attempt to handle or work on the chassis while the power is "On."

Care should be exercised in replacing any part that may be found faulty. All wiring associated with the part involved must be taken off, and especial attention given to possibility of damage to other wiring or parts. The relation of wiring and parts should be the same as in the original assembly.

RADIOTRON SOCKET VOLTAGE TABLE

120-Volt, Supply Line

RADIOTRON			Cathode Volts to Ground DC.	Screen Grid Volts To Ground DC.	Plate Volts to Ground DC.	Cathode Current MA-DC.	Anode Volts to Ground DC.		Deflecting Plates to Ground DC.		Filament or Heater Volts AC.
Socket Number	Type	Function					No. 1	No. 2	D_1	D_3	
5	RCA-913	Cathode Ray	−350	—	—	.06	−265 to −300	O	+30 to —50*	+30 to —50*	6.3
1	RCA-80	Rectifier	+35	—	−380	6	—	—	—	—	5.0
3	RCA-6C6	20—15,000 Cycle Amp.	−380	−350	−150*	.3	—	—	—	—	6.3
4	RCA-6C6	20—15,000 Cycle Amp.	−380	−350	−150*	.3	—	—	—	—	6.3
2	RCA-885	30—10,000 Cycle Osc.	−350	—	—30	.2—2ma.	—	—	—	—	2.5

* Cannot be correctly measured with ordinary voltmeter.

Figure 23

(4) Voltage Measurements

One means of learning the condition of operation and tracing the circuit faults of the Oscillograph is by checking the correctness of the voltages and currents at the Radiotron sockets. The normal values, which can be expected to be found when the instrument is working properly under the specified power ratings, are indicated adjacent to the socket positions in Figure 24, and also given by the Radiotron Socket Voltage Table. In general, the values shown are measured from the socket contacts to ground; however, the heater or filament voltages are a-c and appear between the F-F or H-H clips. All readings given are actual operating values, and do not allow for any errors likely to be caused by current drain of the measuring instrument. Some of the voltages are not measurable with ordinary test equipment; these have been asterisked (*) in the table.

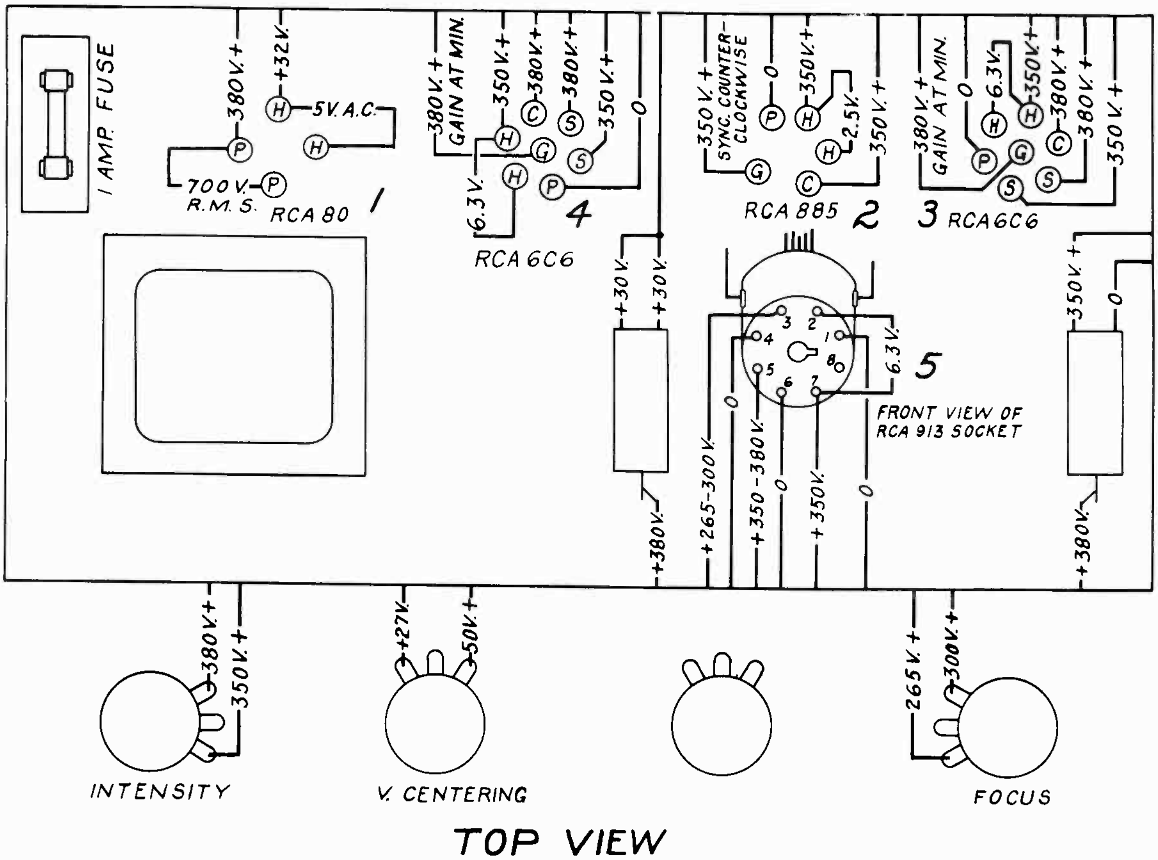


Figure 24—Radiotron Socket Voltage Diagram (Stock No. 151 and 151A)

CATHODE-RAY OSCILLOGRAPH

No. 151 and 151A

POSITION OF CONTROLS FOR VARIOUS APPLICATIONS

No.	APPLICATION OR DEMONSTRATION	SWITCH POSITIONS			CONTROLS							APPLIED VOLTAGES			REMARKS
		Ampl. V	Ampl. H	Range	Intensity	Focus	Ampl. V Gain	Ampl. H Gain	Freq.	Sync.	"Vert." Bdg. Post	"Horiz." Bdg. Post	"Sync." Bdg. Post	
1	FIRST OBTAINING SPOT	Off	*	*	First clockwise rotation closes power switch. Adjust for desired brilliancy of image. Remember tube screen can be burned	Adjust for maximum concentration of electron beam (smallest line or spot) after setting for desired intensity	*	0	*	*	None	None	None	Do not burn screen; adjust the two beam centering control to center spot on screen.
2	LOCATING TUBE POSITION	Off	Timing	*			*	Set for line about ½-in. long	*	*	None	None	None	Rotate cathode-ray tube so line is exactly horizontal.
3	APPLYING VERTICAL DEFLECTING VOLTAGE	On	*	*			Vary	0	*	*	60 cycle supply between 2 and 150 volts	None	None	Elementary Demonstration. Preliminary Adjustments
4	APPLYING HORIZONTAL DEFLECTING VOLTAGE	Off	On	*			0	Vary	*	*	None	60 cycle supply between 2 and 150 volts	None	Elementary Demonstration.
5	APPLYING DEFLECTING VOLTAGE ON BOTH AXES	On	On	*			Vary	Vary	*	*	60 cycle as above	60 cycle supply as above	None	
6	AC VOLTMETER WITHOUT AMPLIFIER	Off	*	*			*	*	*	*	Voltage to be measured	None	None	Set up is same for calibrating; use substitution method.
7	AC VOLTMETER WITH AMPLIFIER	On	*	*			Max. or other calibrated point	*	*	*	Voltage to be measured	None	None	Set up is same for calibrating; use substitution method.
8	OBSERVING WAVE-SHAPE OF AUDIO VOLTAGE	On	Timing	Depends on freq. of observed audio			For desired amplitude	For desired spread	Depends on freq. of observed audio	Just enough to lock image	Voltage to be observed	Jumper to Sync.	Jumper to "Horiz."	Probably greatest application.
9	MEASURING PERCENTAGE OF MODULATION	Off	Timing	Depends on freq. of modulating audio			*	For desired spread	Depends on freq. of modulating audio	Just enough to lock image	RF Voltage to be observed	1 volt or more of audio from modulator	None	Wave-shape method.
10	MEASURING PERCENTAGE OF MODULATION	Off	On	*			*	For desired spread at 100% mod.	*	*	RF Voltage to be observed	2 volts or more of audio from the modulator	None	Trapezoid method.
11	"VISUAL" RF CURVE TRACING	On	Timing	Tap "1" or "2"			For desired amplitude	For desired spread	For double trace	Just enough to lock image	Audio output of chassis 2nd detector	Bdg. posts on Freq. Mod.	None	Output of oscillator impressed in grid circuit of tube preceding stage to be aligned. Center pattern with "Centering V."
12	CHECKING PHASE SHIFT OF AMPLIFIER	On	On	*			For desired vertical deflection	For desired horizontal deflection	*	*	2 volts or more of audio output of amp.	2 volts or more of audio input to amp.	None	
13	FREQUENCY MEASUREMENT	On	Timing or On	Depends on freq. desired			For desired vertical deflection	For desired horizontal deflection	Depends on frequency desired	Just enough to lock image	2 volts or more of signal freq. to be measured	1 volt or more of standard frequency	None	Saw-tooth oscillator in step at 1, ½, ⅓, etc. times standard frequency or use standard frequency direct.

*Denotes position immaterial.

IB-23357

REPLACEMENT PARTS

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

Stock No.	Description		Stock No.	Description	
14118	Power Transformer—110-120 V., 50-60 cyc.	(T-1)	11726	Resistor—6800 Ohms, ¼ W.	(R-14)
14119	Synchronizing Transformer	(T-2)	11322	Resistor—¼ W., 39,000 Ohms	(R-15)
14139	Power Transformer—110-120 V., 25-60 cyc.	(T-3)	14250	Resistor—½ W., 8200 Ohms	(R-18)
6552	Filter Reactor	(L-1)	13915	Resistor—½ W., 12,000 Ohms	(R-19)
4839	Capacitor—0.1 Mfd. 400 V.	(C-1, C-5)	13596	Resistor—2 W., 47,000 Ohms	(R-20)
5005	Capacitor—0.0035 Mfd.	(C-2, C-6)	14126	Potentiometer—10,000 Ohms with Switch	(R-21, S-4)
4841	Capacitor—0.1 Mfd. 200 V.	(C-7, C-3, C-4)	3078	Resistor—½ W., 10,000 Ohms	(R-22)
12536	Capacitor—820 Mmfd.	(C-8)	14125	Potentiometer—10,000 Ohms	(R-23)
5107	Capacitor—0.0025 Mfd.	(C-9)	4750	Switch—D.P.D.T. Toggle	(S-1, S-2)
4858	Capacitor—0.01 Mfd.	(C-10)	14127	Switch—Single Gang 6 Position	(S-3)
5196	Capacitor—0.035 Mfd.	(C-11)	14133	Fuse—1 Amp.	(S-5)
11414	Capacitor—0.1 Mfd.	(C-12)	4794	Tube Socket—4 Prong	
5170	Capacitor—0.25 Mfd.	(C-13)	4814	Tube Socket—5 Prong	
14121	Bypass Condenser—4-10 Mfd.	(C14, C15)	4786	Tube Socket—6 Prong	
14120	Filter Condenser—4-4 Mfd. 475 V.	(C-18, C-16, C-17)	14128	Tube Plug—Octal Base	
14123	Potentiometer—1 Megohm	(R-1, R-7, R-16, R-17)	14129	Tube Support Bracket Ass'y	
11172	Resistor—¼ W., 470,000 Ohms	(R-2, R-8)	14130	Eye Piece	
5144	Resistor—¼ W., 2700 Ohms	(R-3, R-24)	14131	Eye Piece Base	
11647	Resistor—¼ W., 5600 Ohms	(R-4, R-9)	14137	Screen	
11626	Resistor—¼ W., 2.2 Megohms	(R-5, R-6)	4857	Binding Post (High)	
11174	Resistor—¼ W., 220 Ohms	(R-10)	4607	Binding Post (0)	
14124	Potentiometer—250,000 Ohms	(R-11)	7960	Bar Pointer Knob	
14132	Resistor—1 W., 150,000 Ohms	(R-12)	13210	Fuse Term.—Bd. Ass'y	
14122	Potentiometer—2 Megohms	(R-13)			

Instructions 23343
for
Piezo-Electric Calibrator
Type TMV-133A Stock No. 9572

INTRODUCTION

The Type TMV-133A calibrator is a small self-contained testing unit its overall dimensions being only $5\frac{1}{2}$ x $2\frac{7}{8}$ x $2\frac{5}{8}$ inches. It is applicable for making the following frequency calibrations:

1. Dial Scale readings of Receivers and similar instruments.
2. Test Oscillators.
3. Other R-F Oscillators.
4. Signal Generators.
5. Any apparatus generating at specific frequencies between 100 and 50,000 kilocycles.

The test values for any particular calibrations are indicated on the dial scale of the instrument being tested or are of known frequencies. The exact frequency is checked by listening to the note from the calibrator, and the accuracy for all frequencies capable of being tested is that of the piezo electric crystal fundamental, ± 0.05 per cent. The method of test is extraordinarily quick, easy and simple as explained later.

The output from the calibrator is in harmonic steps from 100 k.c. to 20,000 k.c. in 100 k.c. steps, and from 1,000 k.c. to 50,000 k.c. in 1,000 k.c. steps, the former with the lever of the operating toggle switch turned to "Lo" and the latter with it turned to "Hi."

The instrument operates on 110—120 Volt, A-C, 50—60 cycle current, which is used for both heater and plate supply in complete A-C operation, but for heater only in D-C operation. In the former case the plate of the radiotron in the crystal oscillator is supplied with raw A-C potential which gives a 60 cycle modulated RF output signal for receiver dial calibration work. In the latter case an unmodulated signal results from the D-C voltage applied to the plate.

DESCRIPTION

The calibrator consists of a Piezo-Electric Crystal accurately ground for two modes of oscillation (100 k.c. and 1,000 k.c. test steps), and a transformer through which A-C power is supplied for energizing the heater element of an RCA 955 acorn type triode and supplying plate voltage in the case of A-C operation. There are three binding-posts on the front of the case, one marked "—", one marked "+", and one unmarked. These are used only for D-C operation. The A-C power cord with plug is attached inside the case to the central unmarked and negative (—) terminals. The central and positive (+) binding-posts must always be connected by a link for A-C operation. For D-C operation this link must be removed. A double-pole double-throw toggle switch, located on the front of the case, selects either of the two output frequency steps. The necessary coils, resistors and capacitors for completing the circuit are as shown in the accompanying illustrations.

Important—Always remove link between center and "+" binding-posts before connecting for D-C operation. Be careful to prevent electrical contact between binding-posts and ground, as any one binding-post may be 110 Volts above ground according to the way the power cord plug is inserted in outlet.

OPERATION

Before making tests examine the unit by removing the back cover and seeing that the Acorn Tube is properly inserted in its socket. Replace back cover and proceed in the following manner:

A.C. Operation

1. Unwrap Power Cord and insert plug into 110—120 Volt, 50—60 cycle, A-C outlet.
2. Place instrument in convenient location on flat surface, with back cover down, in close proximity to the instrument to be calibrated (within two or three feet).
3. Set lever of toggle switch to "Lo" for 100 k.c. steps or "Hi" for 1,000 k.c. steps according to the requirements of the test.
4. Tune the instrument being tested and notes will be heard at frequencies which are multiples of the fundamental being used. If an audible note is not produced by direct radiation, it may be necessary to provide sufficient coupling by connecting a wire to the terminal marked "ant" of the instrument being tested, winding a few turns and laying the coil so formed lengthwise on top of the calibrator. Too much coupling is apt to cause confusion in distinguishing the correct calibration point.
5. In testing a series of values such as the

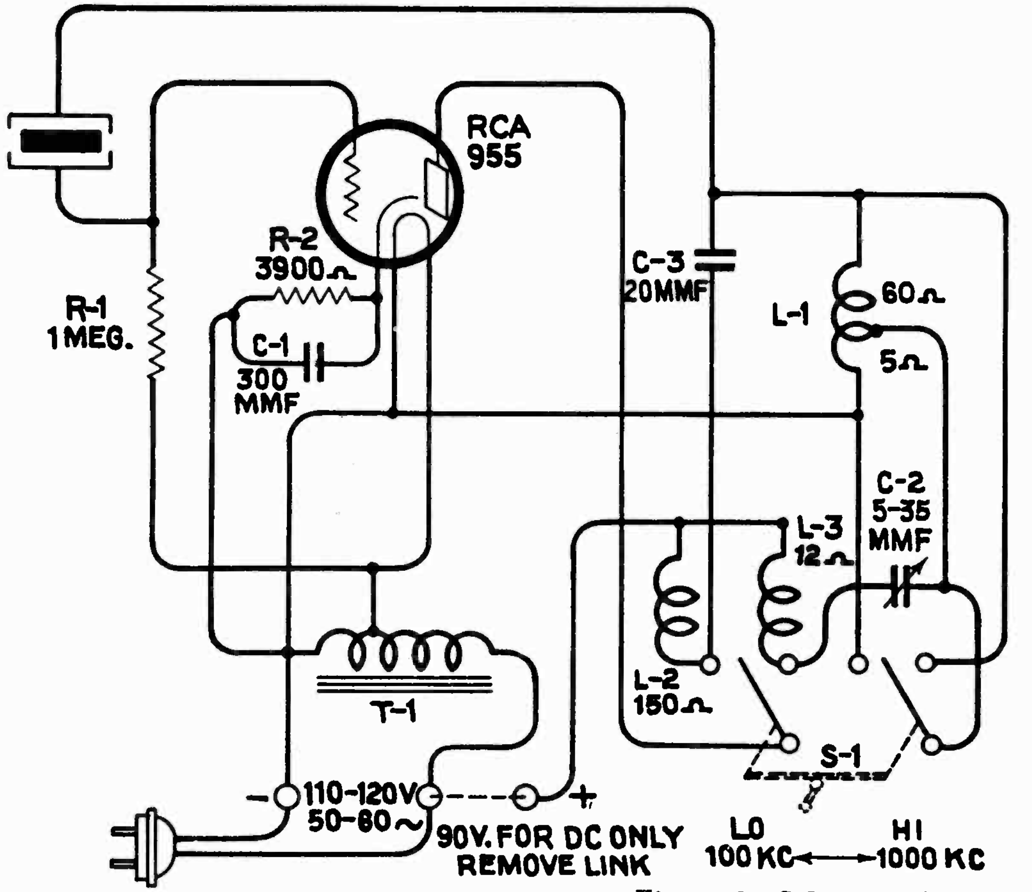


Figure 1—Schematic Diagram

VIEWED FROM BACK

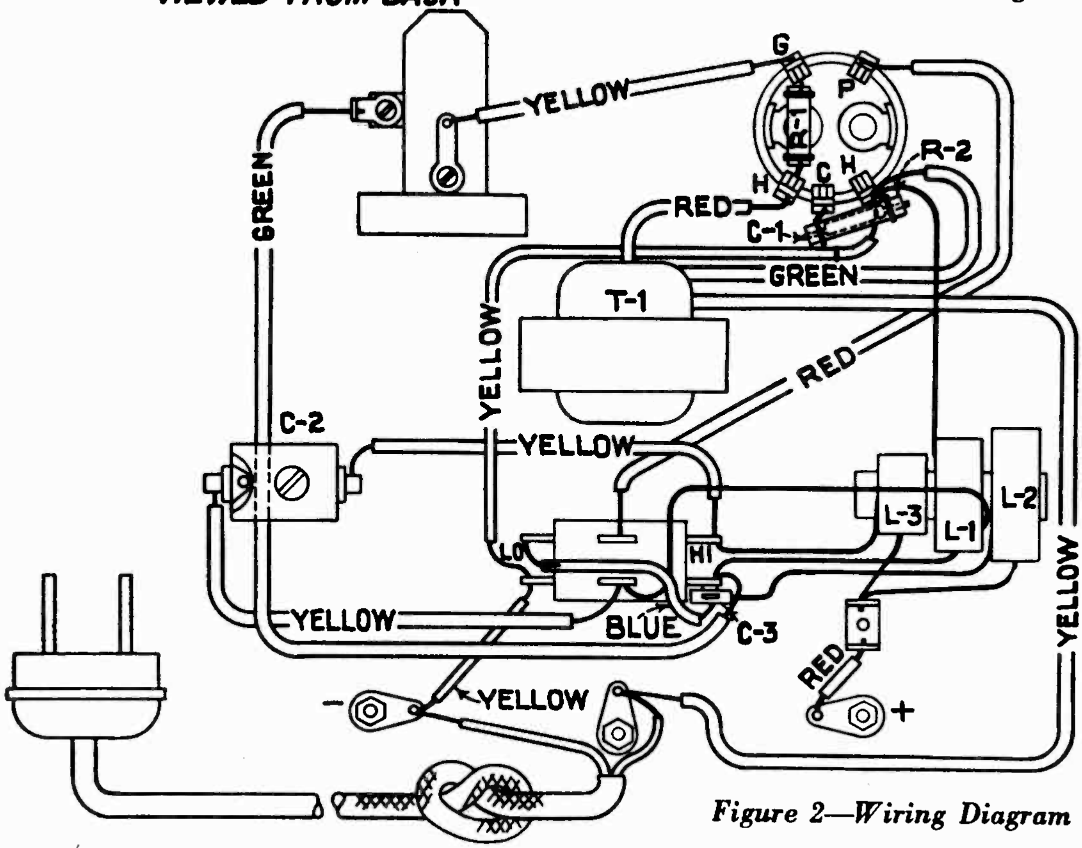


Figure 2—Wiring Diagram

markings on the dial scale of an "All-Wave" receiver, the operating switch is placed on "Lo" for the lower frequencies, and the tuning knob of the receiver turned. At each 100 k.c. value the calibrator note is heard, and the receiver may be adjusted accordingly. When the note becomes weak, perhaps as the 10,000 k.c. range is approached, depending on receiver sensitivity and noise level, attach a few feet of wire to the antenna stud of the receiver and wind a coil in the free end for coupling, as explained in the foregoing paragraph. To check an independent value, such as that of 15,250 k.c. (FYA, Paris, France), turn the Switch to "Hi" for 1,000 k.c. steps and locate the 15 m.c. point. Now, switch to "Lo" and count forward to the 15.2 and 15.3 m.c. points. The 15,250 k.c. point will be midway between.

D-C Operation

1. Remove link between center unmarked binding-post and the one on the left marked "+", and attach the leads from the D-C source to the two outside posts marked "+" and "—".

2. Insert plug on power cord in A-C, 110—120 Volt, 50—60 cycle outlet. On grounded systems where D-C line voltage is used for plate potential the grounded side of the two systems must be connected common.

3. Locate calibrator and proceed as for A-C operation using coupling coil where necessary. The note will be a hiss with the unmodulated D-C excitation.

Additional Tests

1. Calibration of Test Oscillator or Signal Generator connected to Receiver:

a. Connect calibrator for either A-C or D-C operation and couple to receiver to give output at required frequency.
b. Couple Test Oscillator or Signal Generator to receiver and adjust frequency to give zero beat with calibrator.
c. Take reading on Test Oscillator or Signal Generator Scale and record any error on calibration chart.
d. Proceed to make tests in a similar manner for all points desired to be checked.

2. Calibration of Test Oscillator Alone.

a. Set Test Oscillator for heterodyne detection.
b. Locate calibrator using coupling if necessary, and listen with headphones for beat note as frequency is slowly varied. With Calibrator on "Lo", zero beat should occur at each 100 k.c. mark.
c. Record errors as required.

Note: It will be found better to make the above tests with calibrator connected for D-C operation.

In calibrating an oscillator such as the TMV 97-C, with receiver, harmonics of the lower oscillator frequencies should be used to beat against harmonics of the calibrator. For example, the tenth harmonic of 360 k.c. on oscillator being tested, will give a beat with the 3600 k.c. signal from the calibrator. Also the tenth harmonic of 370 k.c. will give a beat with the 3700 k.c. crystal calibration signal. Interpolation between the 360 and 370 k.c. point will give a 365 k.c. point on oscillator when calibrating closer than 10 k.c. The following table will serve as a guide in such calibration work. Obviously there are several combinations which may be used. In general it is best to select the lowest oscillator harmonic which will beat with a harmonic from the calibrator.

Oscillator		Calibrator		Receiver
Setting k.c.	Harmonic used	Fundamental k.c.	Harmonic used	Setting k.c.
90	10th	100	9th	900
100	10th	100	10th	1000
100	10th	1000	1st	1000
100	5th	100	5th	500
110	10th	100	11th	1100
120	10th	100	12th	1200
120	5th	100	6th	600
130, 140, 150	10th	100	13th, 14th, 15th	1300, 1400, 1500
160, 170, 180	10th	100	16th, 17th, 18th	1600, 1700, 1800
190	10th	100	19th	1900
200	3rd, 4th, 5th	100	6th, 8th, 10th	600, 800, 1000
200	10th	1000	1st	1000
200	10th	1000	2nd	2000
210	10th	100	21st	2100
:	:	:	:	:
:	:	:	:	:
1000	1st	1000	1st	1000
1500	2nd	1000	3rd	3000
2000	1st	1000	2nd	2000

MAINTENANCE

It may be necessary occasionally to replace the radiotron RCA 955, but other troubles should not occur. The crystal is a single unit with two modes of oscillation and so long as the 1000 k.c. adjusting capacitor is not moved, the two frequencies will maintain their proper relation to each other. After long continued usage if output becomes weak or unit becomes inoperative make a careful check for circuit troubles. Then, finally, if necessary, remove and clean the crystal. This is done by removing the three nuts from the studs holding the crystal top plate, lifting off the top plate, taking out crystal and cleaning crystal and top and bottom plates with pure alcohol. To reassemble, tighten nuts evenly till top plate just touches crystal when there will be no "shake" and crystal will not oscillate. Now back off approximately one turn on each nut until crystal oscillates normally. Check by means of a broadcast station such as WLW– 700 k.c., or other even 100, with a receiver and with calibrator switch on "Lo". Readjust crystal by turning nuts on top plate till the 700 k.c. point gives an audio beat with the station. For 0.05 per cent accuracy the audio note will vary with the station used. Using 700 k.c., crystal would be adjusted for an audio note of 350 cycles. Adjusting to a lower audio frequency gives a higher accuracy on crystal. If adjustment of the 1000 k.c. trimmer has not been changed the 1000 k.c. steps (switch on "Hi") will automatically be correct. A fibre or bakelite wrench should be used for making final adjustments.

REPLACEMENT PARTS

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

Stock No.	DESCRIPTION	List Price
11858	Capacitor—18 mmfd.—(C3)	$0.16
3981	Capacitor—300 mmfd.—(C1)	.30
11859	Capacitor—Trimmer capacitor—(C2)	.25
11854	Case—Crystal calibrator case and cover	1.45
11852	Coil—Coil assembly—(L1, L2, L3)	1.10
11856	Electrode—Bottom section	1.20
11855	Electrode—Top section	1.20
5113	Resistor—3900 ohms—Carbon type—¼ watt—(R2)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt—(R1)—Package of 5	1.00
11860	Socket—Radiotron socket—5 contact	.25
11857	Spring—Electrode spacing spring—Package of 6	.20
11851	Switch—Toggle switch	1.20
11853	Transformer—Power transformer—(T1)	1.00

Caution—Before operating with D-C plate potential, remove link between center and positive (+) binding posts on front of case.
Any binding post may be 110 volts above ground. Avoid possibilities of electrical contact from any one to ground.

25054
Beat Oscillator
Stock No. 9606
—INSTRUCTIONS—

DESCRIPTION

The Beat Frequency Oscillator is an important auxiliary to short wave receiving sets and serves the purpose of enabling the listener to obtain code messages and other continuous wave broadcasts. It may also be used in locating regular broadcast or other modulated forms of transmission by the "birdie" method and its value in this field will be most evident in cases where the signal strength is very low or the carrier is not modulated continuously.

This Beat Oscillator is of the electron-coupled type known to afford excellent frequency stability and the complete unit as shown in Figure 1 consists of the coil assembly, tube socket, switch, control rod and terminal boards, with the necessary tube, coil and other shields, leads and connectors, all assembled complete on a metal base ready for attachment in the receiver cabinet or other desired location. Its overall dimensions are 7 inches wide, 2¾ inches deep and 7 inches high.

The oscillator tube is not supplied and the type selected will be in accordance with heater or filament voltage as follows:

For 2.5 volts use RCA-58 tube.
For 6.3 volts use RCA-6D6 tube.

The coil assembly includes the coil and two variable capacitors as well as other capacitors and resistors.

The Beat Oscillator may be used with any type of receiver in conformance with the opening paragraphs under Installation, either AC or DC and of any line voltage or frequency.

INSTALLATION

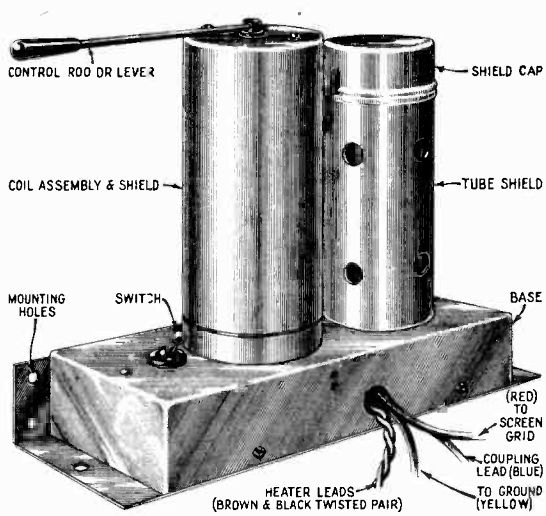
Before commencing installation check the receiver characteristics for compliance with the following requirements:—

1. Short-wave superheterodyne type.

2. Intermediate frequency between 415 and 700 k.c.

3. Extra power available for the additional heater filament of the Beat Oscillator tube without overloading transformer, rectifier or vibrator or affecting plate or bias voltages of any tubes.

4. Correct heater voltage (2.5 or 6.3) for oscillator tube.



Mounting

The Beat Frequency Oscillator may be mounted in any position and is easy to install by following these instructions.

1. Decide on location for mounting. The unit may be attached in any position, horizontally or vertically, inside or outside the cabinet as for example:—

(a) Inside the cabinet at the top right hand side, looking in the back of the cabinet, with the lever projecting near the speaker and the switch accessible at the back.

(b) Attached to the chassis in position shown in Figure 1 with the unit projecting out at the back of the cabinet.

(c) On the outside of one side of the cabinet.

2. Hold the unit in the selected location and mark the position of the mounting holes. There are two sets of holes in the base, one set for attaching at right angles to and the other parallel to the mounting surface. Check to make sure that the oscillator is free from obstructions, with clearance for at least a half circle movement of the control rod,

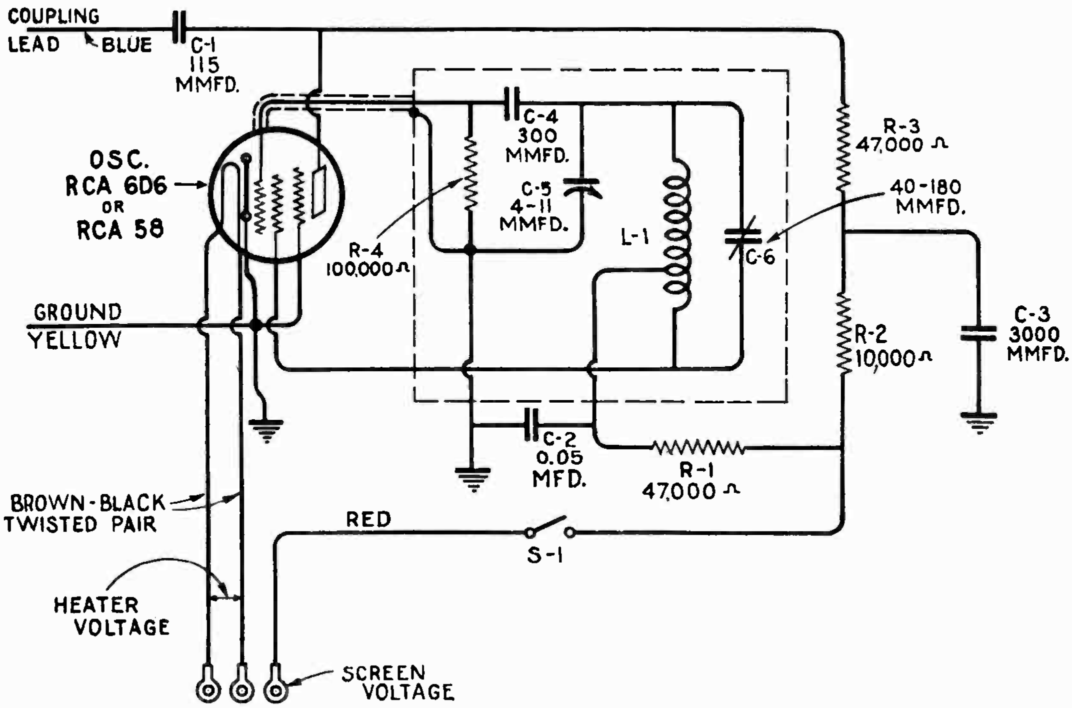


Figure 2—Schematic Diagram

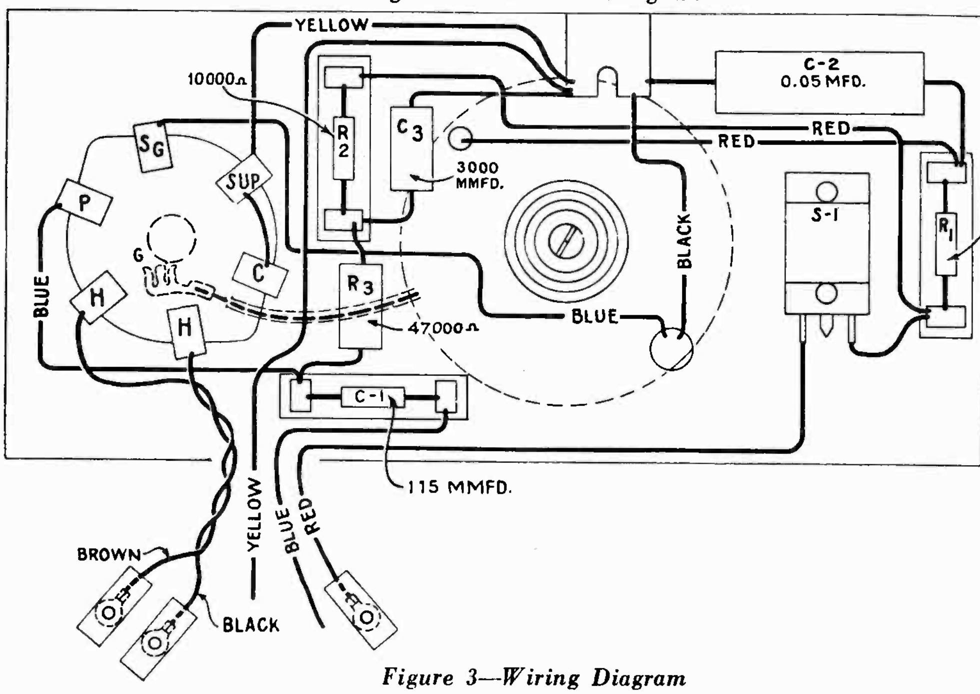


Figure 3—Wiring Diagram

switch accessible, and provision for making connections.

3. Drill holes for mounting.

4. Install tube in socket by removing shield cap, inserting tube in place, attaching spring connector on shielded lead to dome terminal of tube, and replacing shield cap.

5. Attach unit in place with either wood screws or small bolts, nuts and washers as required for particular location.

Note—A setting or adjustment of the main tuning capacitor will be necessary when first operating. This is made with a screwdriver through a hole in the bottom of the chassis under the coil assembly and this fact should be borne in mind when making the installation.

Connections

See that the receiver power switch is *off* and proceed to make connections as follows:—

1. Attach the connectors of the brown-black twisted pair to the heater or filament prongs of any one of the receiver tubes having the proper filament voltage. Make a final check on tube voltages after clipping on.

Note—Do not connect to rectifier filament.

2. Attach the connector on the red lead from the switch to the screen grid terminal of any easily accessible tube having a screen voltage of approximately 100.

3. Attach the yellow lead to any accessible receiver ground terminal or to point at —B voltage if the chassis is not grounded to the rectifier system. This connector should be as short as possible.

4. Wrap the blue lead a few turns around an unshielded portion of the I.F. or detector grid lead in the receiver so as to provide a small capacitance. The number of turns will depend on the receiver circuits and several trial wrappings should be made to determine the most satisfactory number of turns.

Difficulty may be experienced in obtaining the proper amount of coupling and the following procedure is advised in making this connection.

(a) Make wrap of about 4 turns as explained above.

(b) Adjust the Beat Oscillator to the proper frequency as explained under Operation.

(c) Gradually unwind the turns. There may be no response due to excess oscillator input into the receiver. If all turns are unwound and satisfactory results not obtained, move the blue lead slowly away from the I.F. or detector grid lead. It may be necessary to go to a distance of 6 or 8 inches. In such event there may be no means of supporting the blue lead adequately in the required position. It should then be wrapped one turn around the grid lead and a capacitor connected from the end of the blue lead to ground (chassis). The size of the capacitor must be decided by trial and may be anywhere between 10 and 1000 mmfd. for first trial.

OPERATION

1. Turn oscillator switch *off* and carefully tune the receiver to an unmodulated or weakly modulated carrier at any frequency.

2. Turn oscillator switch *on* and move the control rod into line with the screws holding the shield. (The oscillator switch controls the plate and screen grid supply voltages to the oscillator but the filament remains constantly heated thus rendering the tube ready for instantaneous operation.)

3. Adjust the main tuning capacitor of the Beat Oscillator with screwdriver, through hole in bottom of Beat Oscillator chassis, to closely approximate zero beat. This capacitor and the one operated by the control rod are both variable air-dielectric capacitors and are effectively connected in parallel.

4. Adjust the auxiliary tuning capacitor by means of the control rod to produce a suitable note. This capacitor is actually a vernier control which permits adjustment of the Beat Oscillator output frequency over a very limited range on either side of the signal intermediate frequency (zero-beat position).

Note—With the main tuning capacitor set at 460 k.c. and the control rod at the center of rotation, the range of the auxiliary capacitor will be approximately 3500 cycles on each side of zero beat.

5. For c-w (code) reception adjust the Beat Oscillator frequency to a value one or two kilocycles above or below the intermediate frequency of the receiver so as to provide an audio-frequency beat note when the receiver is tuned to resonance with any carrier. The gang capacitor in the receiver should be adjusted to the center of the carrier by listening to the "swish" or "key clicks" before turning *on* the Beat Oscillator switch. Adjust the pitch with the control rod—never by means of the receiver tuning control knob.

The pitch may be varied at will either to satisfy personal preference or to eliminate interfering signals. Best intelligibility and greater apparent volume due to the inherent sensitivity characteristic of the human ear will result using a moderately low pitch or beat frequency in the order of 500 to 1000 cycles, but *audio-image interference* will decrease with ascending pitch.

Audio-image interference is an effect entirely distinct from that commonly referred to in superheterodynes by the term *image frequency response*. By the latter is meant interference set up by an incoming carrier on the same side of the desired carrier as the *radio-frequency* oscillator signal but removed from the desired carrier by *exactly* twice the receiver intermediate frequency.

Audio-image interference is created when an interfering signal of a frequency close to that of the desired signal, passes through the receiver and is converted to an intermediate frequency which is located on the same side of the I-F frequency, formed by the desired signal, as the Beat Oscillator frequency. If this *undesired* I-F frequency is separated by *exactly* twice the separation of the Beat Oscillator frequency from the desired I-F frequency a *true audio-image interference* will result. If one merely visualizes the sharp selectivity curve of the superheterodyne, he will observe at once that the attenuation offered by the tuned circuits of the receiver to such *image* responses will increase very rapidly as the Beat Oscillator separation is widened.

Beat notes produced by other signals than that causing a *true audio image* ordinarily will be distinguishable from the desired signal because of the dissimilarity of pitch. In cases where both sound almost alike, confusion between the desired and undesired signals can practically always be eliminated by shifting the setting of the Beat Oscillator to the opposite side of the I-F frequency.

If a beat note of approximately the same pitch as the desired signal is heard, the interfering signal must be either near the frequency of resonance or near the *audio-image* frequency. For the first condition, best discrimination will be obtained by using a fairly low pitch frequency on the opposite side of zero beat from the interfering frequency. Use of a relatively low pitch is recommended since for a given small frequency separation, say 100 cycles, two notes will be much more discernible in the region of 500 cycles than at 1500 cycles. When the interfering signal is at or near the *audio-image* frequency, however, two alternatives are possible. The oscillator frequency can be either adjusted to zero beat with the frequency of interference or swung through zero beat with the desired signal to some value on the opposite side of I-F resonance.

As an example to illustrate the latter alternatives, suppose that with the receiver tuned to a station the Beat Oscillator is adjusted to one kilocycle *above* the intermediate frequency and that an interfering signal is present at 1900 cycles above I-F resonance (100 cycles below the *audio-image* frequency). Thus, the desired signal will produce a one kilocycle note and the interfering signal a note of 900 cycles, these tones being sufficiently close that the former probably would not be readily discernible. By increasing the oscillator frequency 900 cycles, however, the desired signal would be heard as a 1900 cycle note and the undesired signal heterodyned to zero frequency. On the other hand, the oscillator frequency could be changed to a point on the opposite side of I-F resonance so that the desired signal would again be heard as a one kilocycle note. The interfering signal then would produce a note of 2900 cycles and so should cause no confusion.

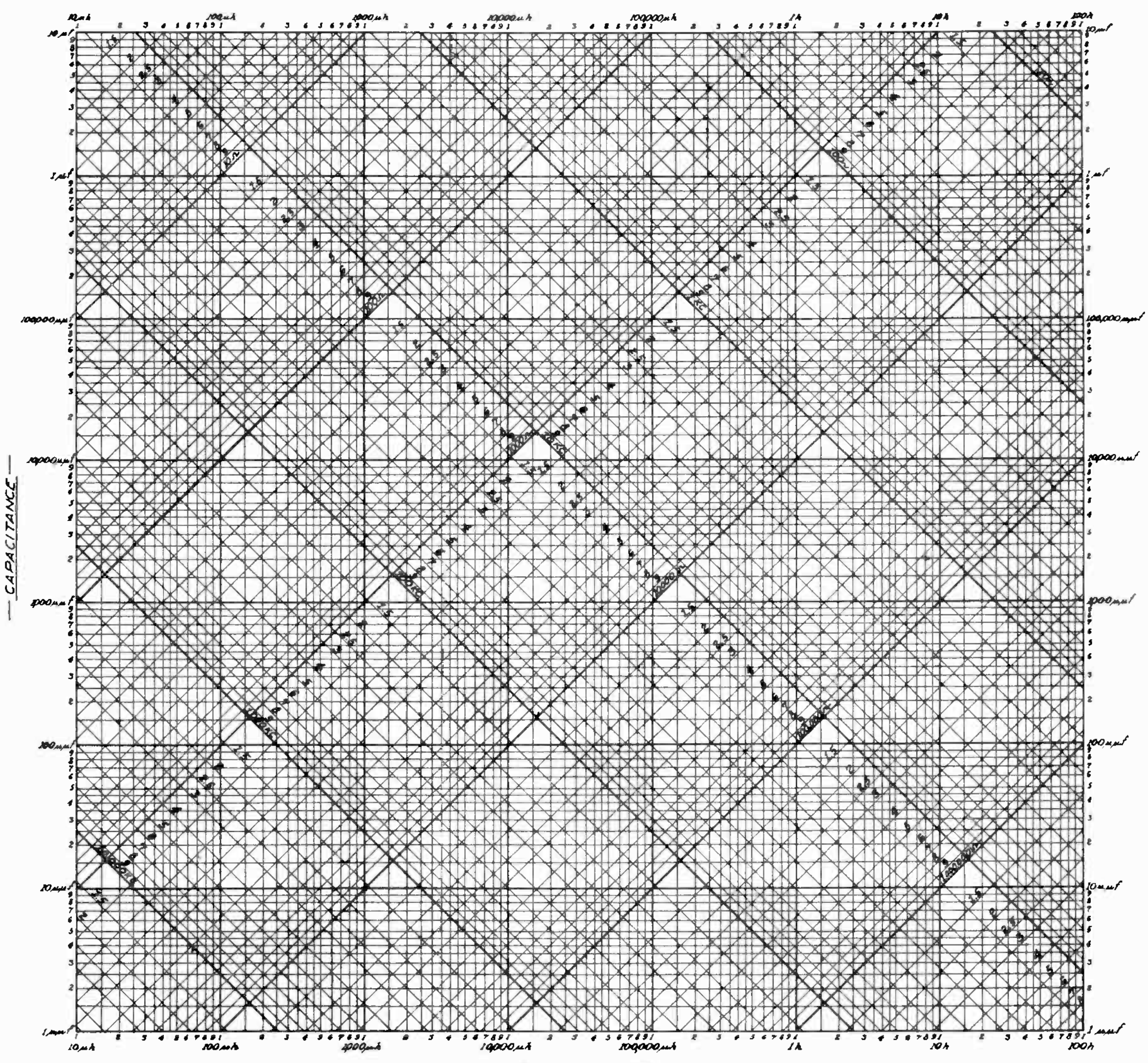
6. In locating weak, modulated signals the Beat Oscillator is tuned exactly to the intermediate frequency of the receiver so that an audio-frequency note of ascending pitch is obtained on each side of every incoming carrier. To adjust the Beat Oscillator in this manner, tune the receiver accurately to any carrier of suitable strength, turn the Beat Oscillator *on* and swing the control rod in either direction until "zero beat" is obtained. Any other carrier will be tuned to exact resonance when the gang or tuning capacitor of the receiver is adjusted for "zero beat" and weak signals will be heard almost as well as those of greater strength because of the heterodyne "whistle" produced while passing through resonance.

REPLACEMENT PARTS

Stock No.	DESCRIPTION	Price List	Stock No.	DESCRIPTION	Price List
4244	Cap—Grid contact cap—Package of 5	$0.20	8077	Handle—Beat Oscillator Adjustment Handle—Complete with knob	$0.50
8076	Capacitor—115 Mmfd.—(C1)	.20	3078	Resistor — 10,000 Ohms — Carbon Type — ½ Watt—Package of 5—(R2)	1.00
8075	Capacitor—3000 Mmfd.—(C3)	.35	8074	Resistor — 47000 Ohms — Carbon Type — ½ Watt—Package of 5—(R1, R3)	1.00
4886	Capacitor—0.05 Mfd.—(C2)	.20	6955	Shield—Radiotron shield and shield cap	.25
5209	Coil—Beat Frequency Oscillator Coil Assembly—Complete with shield and control handle (L1, C4, C5, C6, R4)	7.28	4786	Socket—6-contact Radiotron socket	.15
			7900	Switch—Control switch—toggle type (S1)	.75

CHART OF FREQUENCY OR IMPEDANCE
VS.
INDUCTANCE AND CAPACITY

The Chart shown below provides a quick method of determining several unknown factors when one or more are known. The Chart covers a very wide range, namely, from 10 micro-henries to 100 henries inductance, 10 cycles to 50.000 kilocycles, 1 ohm to 10 megohms and 1 micro-microfarad to 10 microfarads. If, for example, one wishes to know the capacitance to use with a 10 henry inductor to have it resonate at 50 cycles, it can be readily seen that it would be a 1 mfd. capacitor. This is determined by finding the intersection of the vertical line representing 10 henries and the oblique line representing 50 cycles. The intersection occurs at the horizontal line representing 1 mfd. The other oblique line at this intersection represents the impedance at this frequency. This is approximately 3000 ohms.



RCA LOUDSPEAKERS AND REPLACEMENT PARTS

Ext.Dia. Cone Housing (inches)	Speaker Stk.No.	Spkr. No. Stamped on Spkr.Frame	V.C.Impedance (ohms)	Field D. C. Resis. (ohms)	Cone & Voice Coil Stk.No.	Dust Cap Stk.No.	Field Coil Stk.No.	Neut. Coil Stk.No.	Output Trans. Stk.No.	PLUG		TERMINAL BOARD	
										Contacts.	Stk.No.	No. Terms.	Stk.No.
5	9044	RL 57-1	4.0	5900	8987	N.U.	△ 9037	N.U.	6591		N.U.		N.U.
5	✱ 9426	67821-1	760.	P.M.	7594	N.U.	N.U.	N.U.			N.U.		N.U.
5	9429	RL 56-1	4.0	P.M.	7598	N.U.	N.U.	N.U.	6477		N.U.		N.U.
5	9435	RL 54-1	4.0	1364	8987	N.U.	△ 8988	N.U.	6467		N.U.		N.U.
5	9436	RL 57-3	4.0	1800	8987	N.U.	△ 9437	N.U.	6659		N.U.	3	6184
5	9458	RL 57-5	4.0	1500	8987	N.U.	△ 9459	N.U.	6764		N.U.		N.U.
5	9462	RL 54-5	4.0	5900	8987	N.U.	△ 7606	N.U.	6509		N.U.		N.U.
5	9467	RL 57-6	4.0	1800	8987	N.U.	△ 9437	N.U.	6788		N.U.	3	6184
5	9684	80864-1	4.5	3000	⊖ 12498	N.S.S.	12499	12731	12500		N.U.		N.U.
5	9750	80864-2	3.1	3000	⊖ 13148	N.S.S.	13149	I.F.C.	13151		N.U.		N.U.
5	✱ 9772	81362-2	3.0	6	⊖ 13703	N.S.S.	N.R.	N.U.			N.U.		N.S.
5-1/32	✱ 9470	73245-1	760.	P.M.	9471	N.U.	N.U.	N.U.			N.U.		N.U.
6-15/32	7847	RL 61A-1	4.0	1350	9492	N.U.	△ 7845	N.U.	7846		N.U.	3	4448
6-15/32	✱ 9491	RL 61-1	4.0	4	9492	N.U.	△ 9493	N.U.			N.U.		N.S.
6-15/32	9494	RL 61-2	4.0	4	9492	N.U.	△ 9496	N.U.	6982		N.U.		N.S.
6-15/32	9497	RL 61-3	4.0	40	9499	N.U.	△ 9498	N.U.	6988		N.U.		N.S.
6-15/32	9514	RL 61-4	4.0	1290	9492	N.U.	△ 9531	N.U.	4505		N.U.	3	4448
6-15/32	9547	RL 61A-3	4.0	1800	9588	N.U.	△ 9548	N.U.	4803		N.U.	3	4448
6-15/32	9561	RL 61A-2	4.0	1290	9588	N.U.	△ 9531	N.U.	4505		N.U.	3	4418
6-15/32	9586	RL 61A-4	4.0	1290	9588	N.U.	△ 9587	N.U.	4893	3M	(1) 5118		N.U.
6-15/32	9630	RL 61A-5	4.0	1800	9588	N.U.	△ 11672	N.U.	4893	3M	(1) 5118		N.U.
6-9/16	9043	RL 55-3	4.0	1364	9428	N.U.	△ 9041	N.U.	6467		N.U.	3	6184
6-9/16	9440	RL 55-1	4.0	1060	9428	N.U.	△ 9032	N.U.	6467		N.U.	3	6184
6-9/16	9447	RL 55-5	4.0	1350	9428	N.U.	△ 9448	N.U.	6730		N.U.	3	6184
6-9/16	9449	RL 55-4	4.0	1290	9428	N.U.	△ 9450	N.U.	6476		N.U.	3	6184
6-9/16	✱ 9453	RL 59-3	4.0	P.M.	9428	N.U.	N.U.	N.U.			N.U.		N.S.
6-9/16	9485	RL 55A-1	4.0	1800	9428	N.U.	△ 9486	N.U.	6788		N.U.	3	6184
6-9/16	9487	RL 55-6	4.0	1364	9428	N.U.	△ 9041	N.U.	6476		N.U.	3	6184
6-9/16	✱ 9687	72684-1	3.0	4	⊖ 12451	N.S.S.	12450	N.U.			N.U.	3	12482
6-9/16	9798	72945-2	3.2	1290	⊖ 13677	N.S.S.	13676	N.S.	13678	3M	(1) 5118		N.U.
6-9/16	9776	72870-1	3.2	1290	⊖ 13821	N.S.S.	13822	N.S.	13823	3M	(1) 5118		N.U.
6-5/8	9502	RL 59-5	4.0	P.M.	9428	N.U.	N.U.	N.U.	6996		N.U.		N.S.
6-41/64	9698	72742-2	3.2	1875	⊖ 12574	N.S.S.	12576	12446	12575	3M	(1) 5118		N.U.
6-41/64	9779	72854-2	3.2	825	⊖ 13902	N.S.S.	13901	N.S.	13903	5M	(2) 12567		N.U.
7-5/8	✱ 9538	RL 52-4	4.0	P.M.	9539	N.U.	N.U.	N.U.			N.U.	2	N.S.
8-13/64	7818	72203-2	2.0	1290	+ 9533	N.U.	9579	N.S.	4818		N.U.	3	N.S.
8-13/64	9532	72203-1	2.0	1070	+ 9533	N.U.	9534	N.S.	9535		N.U.	4	N.S.
8-13/64	9578	72203-5	2.0	1290	+ 9533	N.U.	9579	N.S.	4818	3M	(1) 5118	3	N.S.
8-13/64	9593	72203-4	2.0	1070	+ 9533	N.U.	9534	N.S.	9535	4M	(3) 5039	3	N.S.
8-13/64	9596	72253-2	2.0	4	9598	N.U.	9597	N.U.	5090	5M	(2) 12567	3	N.S.
8-13/64	9617	RL 63-5	2.2	1800	11235	N.U.	11234	11233	11229	4M	(3) 5039	3	11232
8-13/64	9618	RL 63-4	2.2	845	11235	N.U.	11254	11233	11253	3M	(1) 5118	3	11232
8-13/64	9621	RL 63A-2	2.2	1000	11235	N.U.	11470	11469	11253	3M	(1) 5118	3	11232
8-13/64	9634	76365-1	7.8	845	11836	N.U.	N.R.	N.S.	11837	3M	(1) 5118		N.U.
8-13/64	9635	76365-3	2.1	845	11838	N.U.	11844	11842	11843	3M	(1) 5118		N.U.
8-13/64	9636	76365-2	2.1	1800	11838	N.U.	11841	11842	11840	4M	(3) 5039		N.U.
8-13/64	9637	RL 63B-2	2.2	5500	11235	N.U.	11983	11233	11828	4M	(3) 5039	3	11232
8-13/64	9636	RL 63A-6	2.2	1290	11235	N.U.	12012	11469	11253	3M	(1) 5118	3	11232
8-13/64	9643	RL 63B-4	2.2	1060	11235	N.U.	12079	11233	12080	4M	(3) 5039	3	11232
8-13/64	9658	RL 63B-3	2.2	845	11235	N.U.	11254	11233	11253	6M	(4) 11953	4	11954

RCA LOUDSPEAKERS AND REPLACEMENT PARTS (Continued)

Ext.Dia. Cone Housing (inches)	Speaker Stk.No.	Spkr. No. Stamped on Spkr.Frame	V.C.Impedance (ohms)	Field D. C. Resis. (ohms)	Cone & Voice Coil Stk.No.	Dust Cap Stk.No.	Field Coil Stk.No.	Neut. Coil Stk.No.	Output Trans. Stk.No.	PLUG Contacts	PLUG Stk.No.	TERMINAL BOARD No. Terms.	TERMINAL BOARD Stk.No.
8-13/64	9699	RL 63C-1	2.2	1290	⊖ 12642	13866	12012	11469	11253	3M	(1) 5118	3	12641
8-13/64	9711	RL 63C-3	2.2	1900	⊖ 12642	13866	12674	11469	11828	5M	(2) 12567	3	12641
8-13/64	* 9712	RL 73-1	2.2	P.M.	⊖ 12642	13866	N.U.	N.U.		3M	(1) 5118	2	12914
8-13/64	9714	RL 63D-1	2.2	700	⊖ 12642	13866	12912	N.U.	12913	3M	(1) 5118	2	12914
8-13/64	9717	RL 72-2	2.2	P.M.	⊖ 12642	13866	N.U.	N.U.	11828	3M	(1) 5118	2	12914
8-13/64	9720	RL 63D-3	2.2	1800	⊖ 12642	13866	11234	11233	11229	7M	(5) 13062	4	13063
8-13/64	9757	RL 63D-2	3.3	700	⊖ 13290	13866	12912	N.U.	13289	3M	(1) 5118	2	12914
8-13/64	9768	RL 63E-1	2.2	2000	⊖ 12642	13866	13660	11469	13661	3M	(1) 5118	2	12914
8-13/64	9771	RL 63C-4	2.2	1000	⊖ 12642	13866	13600	11469	11253	3M	(1) 5118	3	12641
8-13/64	9773	RL 63E-2	2.2	845	⊖ 12642	13866	11254	11233	11253	3M	(1) 5118	3	12641
8-13/64	11826	RL 63A-4	2.2	1875	11235	N.U.	11827	11469	11828	3M	(1) 5118	3	11232
10-1/4	* 9455	RL 47-1	4.0	P.M.	9432	N.U.	N.U.	N.U.			N.U.		N.S.
10-1/4	9480	RL 45-6	7.5	3000	9481	N.U.	△ 9490	N.U.	6887		N.U.	4	4193
10-3/8	* 7819	RL 64-1	4.0	P.M.	9432	N.U.	N.U.	N.U.			N.U.	2	N.S.
10-3/8	7824	RL 60A-2	4.0	41	8969	N.U.	△ 7825	N.U.	4599		N.U.	4	4193
10-3/8	* 9438	RL 50-6	4.0	6950	8969	N.U.	△ 9439	N.U.			N.U.	3	4473
10-3/8	* 9445	RL 60-1	4.0	1300	8969	N.U.	△ 9444	N.U.			N.U.	4	4193
10-3/8	9461	RL 60-2	4.0	1300	8935	N.U.	△ 9460	N.U.	6770		N.U.	3	4473
10-3/8	9463	RL 53-1	4.0	860	8969	N.U.	△ 9425	N.U.	6455		N.U.	5	5124
10-3/8	9472	RL 50-5	4.0	2950	8969	N.U.	△ 9031	N.U.	6569		N.U.	4	4193
10-3/8	9473	RL 60-4	4.0	1300	8969	N.U.	△ 9460	N.U.	6770		N.U.	3	4473
10-3/8	* 9474	RL 60-3	4.0	100	8935	N.U.	△ 9475	N.U.			N.U.	4	4193
10-3/8	9508	RL 62-1	7.5	850	7000	N.U.	△ 9509	N.U.	4506		N.U.	4	4193
10-3/8	9527	RL 60A-3	4.0	1300	8935	N.U.	△ 9460	N.U.	4472		N.U.	3	4473
10-3/8	9536	RL 60A-4	4.0	1070	8969	N.U.	△ 9537	N.U.	4637		N.U.	4	4193
10-3/8	9541	RL 62-2	7.5	850	7000	N.U.	△ 9542	N.U.	7826		N.U.	{ 4 3	4193 4473
10-3/8	9543	RL 60A-1	4.0	1975	8969	N.U.	△ 7835	N.U.	7834		N.U.	5	5124
10-3/8	9582	RL 60A-6	4.0	1975	8969	N.U.	△ 9583	N.U.	5080	4M	(3) 5039		N.U.
10-3/8	9589	RL 60B-1	4.0	1300	8935	N.U.	△ 9590	N.U.	4892	3M	(1) 5118		N.U.
10-3/8	9592	RL 60B-2	4.0	1070	8969	N.U.	△ 9591	N.U.	5041	4M	(3) 5039		N.U.
12-5/16	9619	RL 70-1	2.2	845	11258	N.U.	11254	11233	11253	3M	(1) 5118	3	11232
12-5/16	9620	RL 69-1	7.5	1700	8056	N.U.	△ 11189	N.U.	8057	4M	(3) 5039	2	8059
12-5/16	9622	RL 70A-2	2.2	1000	11258	N.U.	11470	11469	11253	3M	(1) 5118	3	11232
12-5/16	* 9629	RL 69-2	7.5	1700	8056	N.U.	11577	N.U.		4M	(3) 5039	2	8059
12-5/16	9639	RL 70A-4	2.2	1290	11258	N.U.	12012	11469	11253	3M	(1) 5118	3	11232
12-5/16	9652	RL 69-5	7.5	1700	8056	N.U.	△ 11189	N.U.	8057	4M	(3) 5039	2	8059
12-5/16	9694	RL 69-3	12.0	380	⊖ 12474	13867	△ 12566	N.U.	12568	5M	(2) 12567	2	8059
12-5/16	9696	RL 70C-1	2.2	1290	⊖ 12667	13866	12012	11469	11253	3M	(1) 5118	3	12641
12-5/16	* 9713	RL 71-1	2.2	P.M.	⊖ 12667	13866	N.U.	N.U.		3M	(1) 5118	2	12914
12-5/16	9716	RL 70B-1	2.2	700	⊖ 12667	13866	12912	N.U.	12913	3M	(1) 5118	2	12914
12-5/16	9719	RL 69-4	12.0	1700	⊖ 12474	13867	△ 11577	N.U.	13007	4M	(3) 5039	2	8059
12-5/16	9736	RL 70B-4	2.2	700	⊖ 12667	13866	12912	N.U.	12913	3M	(1) 5118	2	12914
12-5/16	9758	RL 70B-2	3.3	700	⊖ 13291	13866	12912	N.U.	13289	3M	(1) 5118	2	12914
12-5/16	9766	RL 70C-2	2.2	1000	⊖ 12667	13866	13600	11469	11253	3M	(1) 5118	3	12641
12-5/16	9767	RL 69A-3	12.0	336	⊖ 12474	13867	△ 13614	N.U.	12568	5M	(2) 12567	2	8059
12-5/16	9778	RL 70D-1	2.2	2000	⊖ 12667	13866	13660	11469	12913	3M	(1) 5118	2	12914
12-5/16	* 9780	RL 70B-5	2.2	2000	⊖ 12667	13866	13660	N.U.	13661	3M	(1) 5118	2	12914

N.S. -Not Stocked
N.U. -None Used
M -Male Section
⊖-Includes Dust Cap

P.M. -Permanent Magnet
N.R. -Not Replaceable
+-Includes Cone Housing
I.F.C. -Included In Field Coil

*-Does Not Include Output Transformer
(1) -For Female Section, Use Stock No. 5119
(2) -For Female Section, Use Stock No. 12493
(3) -For Female Section, Use Stock No. 5040

(4) -For Female Section, Use Stock No. 11934
(5) -For Female Section, Use Stock No. 13542
N.S.S. -Not Stocked Seperately, Supplied With Cone
△-Includes Cone Housing, Coil, And Magnet Assembled

RADIO DEFINITIONS*

"A" Power Supply. A power supply device providing heating current for the cathode of a vacuum tube.

Alternating Current. A current, the direction of which reverses at regularly recurring intervals, the algebraic average value being zero.

Amplification Factor. A measure of the effectiveness of the grid voltage relative to that of the plate voltage in affecting the plate current.

Amplifier. A device for increasing the amplitude of electric current, voltage or power, through the control by the input power of a larger amount of power supplied by a local source to the output circuit.

Anode. An electrode to which an electron stream flows.

Antenna. A conductor or a system of conductors for radiating or receiving radio waves.

Atmospherics. Strays produced by atmospheric conditions.

Attenuation. The reduction in power of a wave or a current with increasing distance from the source of transmission.

Audio Frequency. A frequency corresponding to a normally audible sound wave. The upper limit ordinarily lies between 10,000 and 20,000 cycles.

Audio-Frequency Transformer. A transformer for use with audio-frequency currents.

Autodyne Reception. A system of heterodyne reception through the use of a device which is both an oscillator and a detector.

Automatic Volume Control. A self-acting device which maintains the output constant within relatively narrow limits while the input voltage varies over a wide range.

"B" Power Supply. A power supply device connected in the plate circuit of a vacuum tube.

Baffle. A partition which may be used with an acoustic radiator to impede circulation between front and back.

Band-Pass Filter. A filter designed to pass currents of frequencies within a continuous band limited by an upper and a lower critical or cut-off frequency and substantially reduce the amplitude of currents of all frequencies outside of that band.

Beat. A complete cycle of pulsations in the phenomenon of beating.

Beat Frequency. The number of beats per second. This frequency is equal to the difference between the frequencies of the combining waves.

Beating. A phenomenon in which two or more periodic quantities of different frequencies react to produce a resultant having pulsations of amplitude.

Broadcasting. Radio transmission intended for general reception.

By-Pass Condenser. A condenser used to provide an alternating-current path of comparatively low impedance around some circuit element.

"C" Power Supply. A power supply device connected in the circuit between the cathode and grid of a vacuum tube so as to apply a grid bias.

Capacitive Coupling. The association of one circuit with another by means of capacity common or mutual to both.

Carbon Microphone. A microphone which depends for its operation upon the variation in resistance of carbon contacts.

Carrier. A term broadly used to designate carrier wave, carrier current, or carrier voltage.

Carrier Frequency. The frequency of a carrier wave.

Carrier Suppression. That method of operation in which the carrier wave is not transmitted.

Carrier Wave. A wave which is modulated by a signal and which enables the signal to be transmitted through a specific physical system.

Cathode. The electrode from which the electron stream flows. (See Filament.)

Choke Coil. An inductor inserted in a circuit to offer relatively large impedance to alternating current.

Class A Amplifier is an amplifier in which the bias and exciting grid voltages are such that the plate current through the tube flows at all times. The ideal Class A Amplifier is one in which the alternating component of the plate current is an exact reproduction of the form of the input signal, and the plate current flows during the 360 electrical degrees of the cycle. The characteristics of a Class A Amplifier are low efficiency and output.

Class B Amplifier is an amplifier in which the grid bias is approximately equal to that required to cut off the plate current to approximately zero when no exciting grid voltage is applied, so that the plate current in a tube flows during approximately one-half of each cycle when an exciting grid voltage is applied. The ideal Class B Amplifier is one in which the alternating component of plate current is an exact replica of the input signal for the half-cycle when the grid is positive with respect to the bias voltage, and the plate current flows 180 electrical degrees. The characteristics of a Class B Amplifier are medium efficiency and output.

Class C Amplifier is an amplifier in which the grid bias is appreciably more than necessary to cut off the plate current to zero when no exciting grid voltage is present, so that the plate current flows in the tube for appreciably less than one-half of each cycle when an exciting grid voltage is present. At the present time Class C Amplifier application is confined to radio transmission where high plate-circuit efficiency is a paramount requirement and where departures from linearity between input and output are permissible. The characteristics of a Class C Amplifier are high-plate-circuit efficiency and high power output.

(1) **A Class AB Amplifier** is one in which the bias and exciting grid voltages are such that the plate current flows during appreciably more than 180 electrical degrees yet less than 360 electrical degrees of the cycle. This has also been called Class "A prime." The characteristics of a Class AB Amplifier are efficiency and output intermediate between a Class A and a Class B Amplifier. The idle plate current and attendant dissipation may be made substantially less than is possible with Class A Amplifiers.

(2) **A Class BC Amplifier** is an amplifier in which the bias and exciting grid voltages are such that the plate current flows during less than 180 electrical degrees and yet for a considerable part of the cycle. The characteristics of a Class BC Amplifier are efficiency and output intermediate between a Class B and a Class C Amplifier. Class BC Amplifiers are not in general use.

(3) To denote that grid current does not flow during any part of the input cycle, add the suffix 1 to the letter or letters of the class identification. The suffix 2 is used to denote that grid current flows during some part of the cycle.

Condenser Loud Speaker. A loud speaker in which the mechanical forces result from electrostatic reactions.

Condenser Microphone. A microphone which depends for its operation upon variations in capacitance.

Continuous Waves. Continuous waves are waves in which successive cycles are identical under steady state conditions.

Conversion Transconductance is the ratio of the magnitude of a single beat-frequency component $(f_1 + f_2)$ or $(f_1 - f_2)$ of the output current to the magnitude of the input voltage of frequency f_1 under the conditions that all direct voltages and the magnitude of the second input alternating voltage f_2 must remain constant. As most precisely used, it refers to an infinitesimal magnitude of the voltage of frequency f_1.

* Most of these definitions are based on I.R.E. Standards.

Converter (generally, in superheterodyne receivers). A converter is a vacuum-tube which performs simultaneously the functions of oscillation and mixing (first detection) in a radio receiver.

Coupling. The association of two circuits in such a way that energy may be transferred from one to the other.

Cross Modulation. A type of intermodulation due to modulation of the carrier of the desired signal in a radio apparatus by an undesired signal.

Current Amplification. The ratio of the alternating current produced in the output circuit of an amplifier to the alternating current supplied to the input circuit for specific circuit conditions.

Cycle. One complete set of the recurrent values of periodic phenomenon.

Damped Waves. Waves of which the amplitude of successive cycles, at the source, progressively diminishes.

Decibel. The common transmission unit of the decimal system, equal to 1/10 bel.

$$1 \text{ bel} = 2 \log_{10} \frac{E_1}{E_2} = 2 \log_{10} \frac{I_1}{I_2}$$

(See Transmission Unit.)

Detection is any process of operation on a modulated signal wave to obtain the signal imparted to it in the modulation process.

Detector. A detector is a device which is used for operation on a signal wave to obtain the signal imparted to it in the modulation process.

Diaphragm. A diaphragm is a vibrating surface which produces sound vibrations.

Diode. A type of thermionic tube containing two electrodes which passes current wholly or predominantly in one direction.

Direct Capacitance (C) between two conductors—The ratio of the charge produced on one conductor by the voltage between it and the other conductor divided by this voltage, all other conductors in the neighborhood being at the potential of the first conductor.

Direct Coupling. The association of two circuits by having an inductor, a condenser, or a resistor common to both circuits.

Direct Current. An unidirectional current. As ordinarily used, the term designates a practically non-pulsating current.

Distortion. A change in wave form occurring in a transducer or transmission medium when the output wave form is not a faithful reproduction of the input wave form.

Double Modulation. The process of modulation in which a carrier wave of one frequency is first modulated by the signal wave and is then made to modulate a second carrier wave of another frequency.

Dynamic Amplifier. The RCA Dynamic Amplifier is a variable gain audio amplifier, the gain of which is proportional to the average intensity of the audio signal. Such an amplifier compensates for the contraction of volume range required because of recording or transmission line limitations.

Dynamic Sensitivity of a Phototube. The alternating-current response of a phototube to a pulsating light flux at specified values of mean light flux, frequency of pulsation, degree of pulsation, and steady tube voltage.

Electro-Acoustic Transducer. A transducer which is actuated by power from an electrical system and supplies power to an acoustic system or vice versa.

Electron Emission. The liberation of electrons from an electrode into the surrounding space. In a vacuum tube it is the rate at which the electrons are emitted from a cathode. This is ordinarily measured as the current carried by the electrons under the influence of a voltage sufficient to draw away all the electrons.

Electron Tube. A vacuum tube evacuated to such a degree that its electrical characteristics are due essentially to electron emission.

Emission Characteristic. A graph plotted between a factor controlling the emission (such as the temperature, voltage, or current of the cathode) as abscissas, and the emission from the cathode as ordinates.

Facsimile Transmission. The electrical transmission of a copy or reproduction of a picture, drawing or document. (This is also called picture transmission.)

Fading. The variation of the signal intensity received at a given location from a radio transmitting station as a result of changes occurring in the transmission path. (See Distortion.)

Fidelity. The degree to which a system, or a portion of a system, accurately reproduces at its output the signal which is impressed upon it.

Filament. A cathode in which the heat is supplied by current passing through the cathode.

Filter. A selective circuit network, designed to pass currents within a continuous band or bands of frequencies or direct current, and substantially reduce the amplitude of currents of undesired frequencies.

Frequency. The number of cycles per second.

Full-Wave Rectifier. A double element rectifier arranged so that current is allowed to pass in the same direction to the load circuit during each half cycle of the alternating-current supply, one element functioning during one-half cycle and the other during the next half cycle, and so on.

Fundamental Frequency. The lowest component frequency of a periodic wave or quantity.

Fundamental or Natural Frequency (of an antenna). The lowest resonant frequency of an antenna, without added inductance or capacity.

Gas Phototube. A type of phototube in which a quantity of gas has been introduced, usually for the purpose of increasing its sensitivity.

Grid. An electrode having openings through which electrons or ions may pass.

Grid Bias. The direct component of the grid voltage.

Grid Condenser. A series condenser in the grid or control circuit of a vacuum tube.

Grid Leak. A resistor in a grid circuit, through which the grid current flows, to affect or determine a grid bias.

Grid-Plate Transconductance. The name for the plate current to grid voltage transconductance. (This has also been called mutual conductance.)

Ground System (of an antenna). That portion of the antenna system below the antenna loading devices or generating apparatus most closely associated with the ground and including the ground itself.

Ground Wire. A conductive connection to the earth.

Half-Wave Rectifier. A rectifier which changes alternating current into pulsating current, utilizing only one-half of each cycle.

Harmonic. A component of a periodic quantity having a frequency which is an integral multiple of the fundamental frequency. For example, a component the frequency of which is twice the fundamental frequency is called the second harmonic.

Heater. An electrical heating element for supplying heat to an indirectly heated cathode.

Heterodyne Reception. The process of receiving radio waves by combining in a detector a received voltage with a locally generated alternating voltage. The frequency of the locally generated voltage is commonly different from that of the received voltage. (Heterodyne reception is sometimes called beat reception.)

Homodyne Reception. A system of reception by the aid of a locally generated voltage of carrier frequency. (Homodyne reception is sometimes called zero-beat reception.)

Hot-Wire Ammeter, Expansion Type. An ammeter dependent for its indications on a change in dimensions of an element which is heated by the current to be measured.

Indirectly Heated Cathode. A cathode of a thermionic tube, in which heat is supplied from a source other than the cathode itself.

Induction Loud Speaker is a moving coil loud speaker in which the current which reacts with the polarizing field is induced in the moving member.

Inductive Coupling. The association of one circuit with another by means of inductance common or mutual to both.

Interelectrode Capacitance. The direct capacitance between two electrodes.

Interference. Disturbance of reception due to strays, undesired signals, or other causes; also, that which produces the disturbance.

Intermediate Frequency, in Superheterodyne Reception. A frequency between that of the carrier and the signal, which results from the combination of the carrier frequency and the locally generated frequency.

Intermodulation. The production, in a non-linear circuit element, of frequencies corresponding to the sums and differences of the fundamentals and harmonics of two or more frequencies which are transmitted to that element.

Interrupted Continuous Waves. Interrupted continuous waves are waves obtained by interruption at audio frequency in a substantially periodic manner of otherwise continuous waves.

Kilocycle. When used as a unit of frequency, is a thousand cycles per second.

Lead-In. That portion of an antenna system which completes the electrical connection between the elevated outdoor portion and the instruments or disconnecting switches inside the building.

Linear Detection. That form of detection in which the audio output voltage under consideration is substantially proportional to the modulation envelope throughout the useful range of the detecting device.

Loading Coil. An inductor inserted in a circuit to increase its inductance but not to provide coupling with any other circuit.

Loud Speaker. A telephone receiver designed to radiate acoustic power into a room or open air.

Magnetic Loud Speaker. One in which the mechanical forces result from magnetic reactions.

Magnetic Microphone. A microphone whose electrical output results from the motion of a coil or conductor in a magnetic field.

Master Oscillator. An oscillator of comparatively low power so arranged as to establish the carrier frequency of the output of an amplifier.

Megacycle. When used as a unit of frequency, is a million cycles per second.

Mercury-Vapor Rectifier. A mercury-vapor rectifier is a two electrode, vacuum-tube rectifier which contains a small amount of mercury. During operation, the mercury is vaporized. A characteristic of mercury-vapor rectifiers is the low-voltage drop in the tube.

Microphone. A microphone is an electro-acoustic transducer actuated by power in an acoustic system and delivering power to an electric system, the wave form in the electric system corresponding to the wave form in the acoustic system. This is also called a telephone transmitter.

Mixer Tube (generally, in superheterodyne receivers). A mixer tube is one in which a locally generated frequency is combined with the carrier-signal frequency to obtain a desired beat frequency.

Modulated Wave. A modulated wave is a wave of which either the amplitude, frequency, or phase is varied in accordance with a signal.

Modulation is the process in which the amplitude, frequency, or phase of a wave is varied in accordance with a signal, or the result of that process.

Modulator. A device which performs the process of modulation.

Monochromatic Sensitivity. The response of a phototube to light of a given color, or narrow frequency range.

Moving-Armature Speaker. A magnetic speaker whose operation involves the vibration of a portion of the ferromagnetic circuit. (This is sometimes called an electromagnetic or a magnetic speaker.)

Moving Coil Loud Speaker. A moving coil loud speaker is a magnetic loud speaker in which the mechanical forces are developed by the interaction of currents in a conductor and the polarizing field in which it is located. (This is sometimes called an Electro-Dynamic or a Dynamic Loud Speaker.)

Mu-Factor. A measure of the relative effect of the voltages on two electrodes upon the current in the circuit of any specified electrode. It is the ratio of the change in one electrode voltage to a change in the other electrode voltage, under the condition that a specified current remains unchanged.

Mutual Conductance. (See Grid-Plate Transconductance.)

Oscillator. A non-rotating device for producing alternating current, the output frequency of which is determined by the characteristics of the device.

Oscillatory Circuit. A circuit containing inductance and capacitance, such that a voltage impulse will produce a current which periodically reverses.

Pentode. A type of thermionic tube containing a plate, a cathode, and three additional electrodes. (Ordinarily the three additional electrodes are of the nature of grids.)

Percentage Modulation. The ratio of half the difference between the maximum and minimum amplitudes of a modulated wave to the average amplitude, expressed in per cent.

Phonograph Pickup. An electromechanical transducer actuated by a phonograph record and delivering power to an electrical system, the wave form in the electrical system corresponding to the wave form in the phonograph record.

Phototube. A vacuum tube in which electron emission is produced by the illumination of an electrode. (This has also been called photo-electric tube.)

Plate. A common name for the principal anode in a vacuum tube.

Power Amplification (of an amplifier)—The ratio of the alternating-current power produced in the output circuit to the alternating-current power supplied to the input circuit.

Power Detection. That form of detection in which the power output of the detecting device is used to supply a substantial amount of power directly to a device such as a loud speaker or recorder.

Pulsating Current. A periodic current, that is, current passing through successive cycles, the algebraic average value of which is not zero. A pulsating current is equivalent to the sum of an alternating and a direct current.

Push-Pull Microphone. One which makes use of two functioning elements 180 degrees out of phase.

Radio Channel. A band of frequencies or wavelengths of a width sufficient to permit of its use for radio communication. The width of a channel depends upon the type of transmission. (See Band of Frequencies.)

Radio Compass. A direction finder used for navigational purposes.

Radio Frequency. A frequency higher than those corresponding to normally audible sound waves. (See Audio Frequency.)

Radio-Frequency Transformer. A transformer for use with radio-frequency currents.

Radio Receiver. A device for converting radio waves into perceptible signals.

Radio Transmission. The transmission of signals by means of radiated electromagnetic waves originating in a constructed circuit.

Radio Transmitter. A device for producing radio-frequency power, with means for producing a signal.

Rectifier. A device having an asymmetrical conduction characteristic which is used for the conversion of an alternating current into a pulsating current. Such devices include vacuum-tube rectifiers, gas rectifiers, oxide rectifiers, electrolytic rectifiers, etc.

Reflex Circuit Arrangement. A circuit arrangement in which the signal is amplified, both before and after detection, in the same amplifier tube or tubes.

Regeneration. The process by which a part of the output power of an amplifying device reacts upon the input circuit in such a manner as to reinforce the initial power, thereby increasing the amplification. (Sometimes called "feedback" or "reaction.")

Resistance Coupling. The association of one circuit with another by means of resistance common to both.

Resonance Frequency (of a reactive circuit)—The frequency at which the supply current and supply voltage of the circuit are in phase.

Rheostat. A resistor which is provided with means for readily adjusting its resistance.

Screen Grid. A screen grid is a grid placed between a control grid and an anode, and maintained at a fixed positive potential, for the purpose of reducing the electrostatic influence of the anode in the space between the screen grid and the cathode.

Secondary Emission. Electron emission under the influence of electron or ion bombardment.

Selectivity. The degree to which a radio receiver is capable of differentiating between signals of different carrier frequencies.

Sensitivity. The degree to which a radio receiver responds to signals of the frequency to which it is tuned.

Sensitivity of a Phototube. The electrical current response of a phototube, with no impedance in its external circuit, to a specified amount and kind of light. It is usually expressed in terms of the current for a given radiant flux, or for a given luminous flux. In general the sensitivity depends upon the tube voltage, flux intensity, and spectral distribution of the flux.

Service Band. A band of frequencies allocated to a given class of radio communication service.

Side Bands. The bands of frequencies, one on either side of the carrier frequency, produced by the process of modulation.

Signal. The intelligence, message or effect conveyed in communication.

Single-Side-Band Transmission. That method of operation in which one side band is transmitted, and the other side band is suppressed. The carrier wave may be either transmitted or suppressed.

Static. Strays produced by atmospheric conditions.

Static Sensitivity of a Phototube. The direct current response of a phototube to a light flux of specified value.

Stopping Condenser. A condenser used to introduce a comparatively high impedance in some branch of a circuit for the purpose of limiting the flow of low-frequency alternating current or direct current without materially affecting the flow of high frequency alternating current.

Strays. Electromagnetic disturbances in radio reception other than those produced by radio transmitting systems.

Superheterodyne Reception. Superheterodyne reception is a method of reception in which the received voltage is combined with the voltage from a local oscillator and converted into voltage of an intermediate frequency which is usually amplified and then detected to reproduce the original signal wave. (This is sometimes called double detection or supersonic reception.)

Swinging. The momentary variation in frequency of a received wave.

Telephone Receiver. An electro-acoustic transducer actuated by power from an electrical system and supplying power to an acoustic system, the wave form in the acoustic system corresponding to the wave form in the electrical system.

Television. The electrical transmission of a succession of images and their reception in such a way as to give a substantially continuous reproduction of the object or scene before the eye of a distant observer.

Tetrode. A type of thermionic tube containing a plate, a cathode, and two additional electrodes. (Ordinarily the two additional electrodes are of the nature of grids.)

Thermionic. Relating to electron emission under the influence of heat.

Thermionic Emission. Electron or ion emission under the influence of heat.

Thermionic Tube. An electron tube in which the electron emission is produced by the heating of an electrode.

Thermocouple Ammeter. An ammeter dependent for its indications on the change in thermo-electro-motive force set up in a thermo-electric couple which is heated by the current to be measured.

Total Emission. The value of the current carried by electrons emitted from a cathode under the influence of a voltage such as will draw away all the electrons emitted.

Transconductance. The ratio of the change in the current in the circuit of an electrode to the change in the voltage on another electrode, under the condition that all other voltages remain unchanged.

Transducer. A device actuated by power from one system and supplying power to another system. These systems may be electrical, mechanical, or acoustic.

Transmission Unit. A unit expressing the logarithmic ratios of powers, voltages, or currents in a transmission system. (See Decibel.)

Triode. A type of thermionic tube containing an anode, a cathode, and a third electrode, in which the current flowing between the anode and the cathode may be controlled by the voltage between the third electrode and the cathode.

Tuned Transformer. A transformer whose associated circuit elements are adjusted as a whole to be resonant at the frequency of the alternating current supplied to the primary, thereby causing the secondary voltage to build up to higher values than would otherwise be obtained.

Tuning. The adjustment of a circuit or system to secure optimum performance in relation to a frequency; commonly, the adjustment of a circuit or circuits to resonance.

Vacuum Phototube. A type of phototube which is evacuated to such a degree that the residual gas plays a negligible part in its operation.

Vacuum Tube. A device consisting of a number of electrodes contained within an evacuated enclosure.

Vacuum-Tube Transmitter. A radio transmitter in which vacuum tubes are utilized to convert the applied electric power into radio-frequency power.

Vacuum-Tube Volt-Meter. A device utilizing the characteristics of a vacuum tube for measuring alternating voltages.

Voltage Amplification. The ratio of the alternating voltage produced at the output terminals of an amplifier to the alternating voltage impressed at the input terminals.

Voltage Divider. A resistor provided with fixed or movable contacts and with two fixed terminal contacts; current is passed between the terminal contacts, and a desired voltage is obtained across a portion of the resistor. (The term potentiometer is often erroneously used for this device.)

Wave. a. A propagated disturbance, usually periodic, as an electric wave or sound wave.
b. A single cycle of such a disturbance, or,
c. A periodic variation as represented by a graph.

Wavelength. The distance traveled in one period or cycle by a periodic disturbance.

* Most of these definitions are based on I.R.E. Standards.

Receiver Circuit Analysis

All receivers are built around the vacuum tube used as amplifier, detector, rectifier or oscillator. Whenever an open or short occurs in the filament, plate, grid or screen-grid circuit of a vacuum tube, it will have a definite effect upon the voltage and current readings obtained at these different tube elements with an analyzer.

The analyzer is designed to indicate the variations caused by such opens or shorts, and thus enables the service man to determine in which tube circuit the abnormal condition exists. Having done this the analyzer has done all that it is possible for an instrument to do. It now remains for the service man to decide (by analytic reasoning based on previous experience and thought on trouble shooting problems) in which portion of that particular tube's circuits the trouble is.

On the following pages will be found 4 fundamental, schematic diagrams of the complete filament, grid and screen-grid circuits for:

1. Filament type triodes and screen-grid tubes.
2. Heater-cathode type triodes and screen-grid tubes.
3. Filament type pentodes (voltage or power amplifiers).
4. Heater-cathode type pentodes (voltage or power amplifiers).

The various circuits are numbered as:

Example:

1 = grid return from grid of tubes to negative C in grid circuit.

2 = plate circuit from positive B on voltage divider to plate of tube.

On a following page will be found a chart listing the effects noted (as compared to the normal readings) when the various circuits or parts are open or shorted. By the use of this chart, knowing what normal conditions are, and how the abnormal conditions compare with them, it is possible for a service man to narrow his tracing of the suspected tube circuit, down to the testing of one or two of the parts of that circuit.

Diagrams No. 1 and No. 2 apply equally as well to triodes of the filament and cathode-heater types by omitting circuit No. 13 and condenser No. 7 which apply to screen-grid types only.

It will be noted that circuit No. 14 in diagrams No. 3 and No. 4 applies only to a pentode. It represents the connection between the suppressor grid (located between the space charge or screen-grid and plate) and the cathode, or to a point in the circuit whose potential is more negative than the cathode. Since the suppressor grid serves the same purpose (i. e., to practically eliminate the effects of secondary emission) whether the tube be a radio-frequency pentode, such as the 57, or whether it be a power-output pentode, such as the 47, diagrams No. 3 and No. 4 apply equally as well to both types of tubes. The effects upon normal voltage readings when this circuit opens are listed under circuit No. 14 on the following chart. In certain tube types, such as the 47, circuit No. 14 is made within the tube, as indicated by the dotted lines in Fig. 3. An open in this internal connection will cause the same analyzer readings as those noted under circuit No. 14 in the accompanying chart.

Diagram No. 4 applies to triple-grid amplifiers, such as the 89, when used as a pentode power amplifier. When this tube is used as a class A or B amplifier, it would then be classified as a triode, and in this case diagram No. 2 would apply. For information on the operation and connections of the grids of a triple-grid amplifier when used in class A or B amplifier circuits, refer to the set manufacturer's service notes.

Example:

If it is found that the readings at one tube socket show E_{c1} = above normal, I_b = o, E_b = o, E_{kf} = above normal; referring to the chart we see that when this condition exists it indicates a short in No. 6—(the plate by-pass condenser)—when its return is connected to positive side of grid-bias resistor No. 4, or it indicates an open in the cathode circuit through conductor No. 3 or grid-bias resistor No. 4.

The meaning of the symbols used in the reference chart are as follows:—

E_{c1} = Grid voltage or control grid on S. G. tubes.	S = Shorted.
E_{kf} = Cathode voltage on cathode heater tube.	L = Leaking.
E_b = Plate voltage.	Op = Open.
E_{c2} = Screen grid voltage.	O = Zero voltage or current.
E_{c3} = Suppressor grid voltage.	Lo = Below normal.
I_b = Plate current.	Hi = Above normal.
	Nor = Normal.
	F = Fluctuating.

Note: In servicing modern receivers it is extremely desirable that the service man use the set manufacturer's service notes. These will be found to be of great assistance in locating troubles and applying the correct remedy. Most radio set manufacturers will gladly furnish responsible service men with service notes on any model of their receivers upon a written request to the manufacturer's service department.

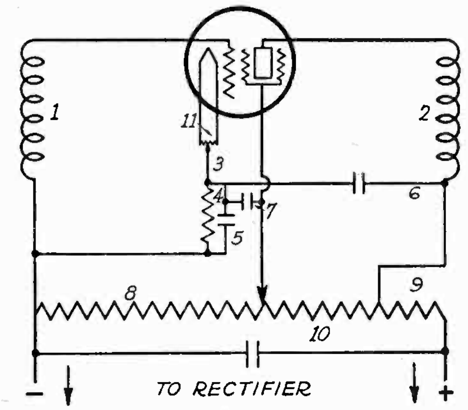


Fig. 1

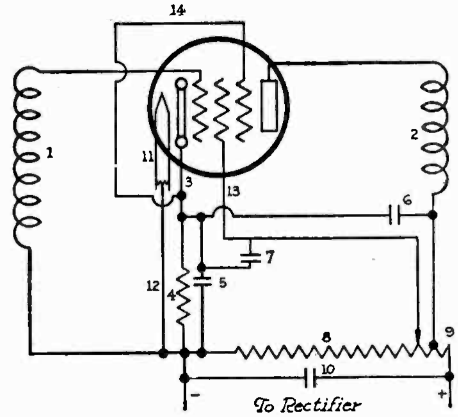


Fig. 4

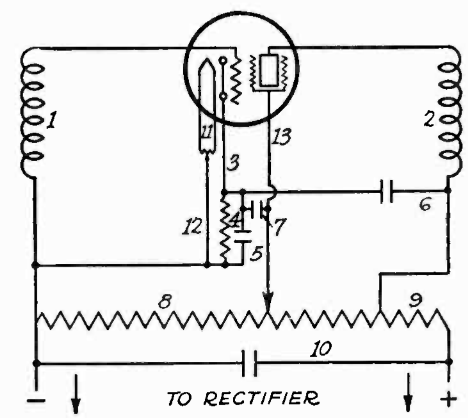


Fig. 2

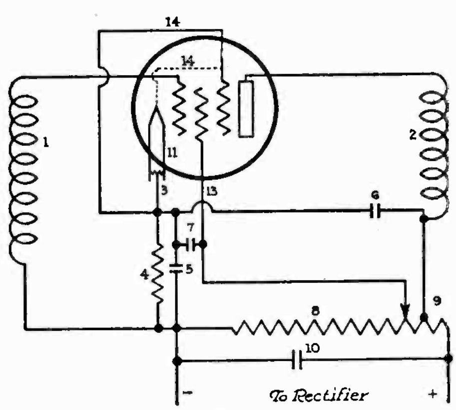
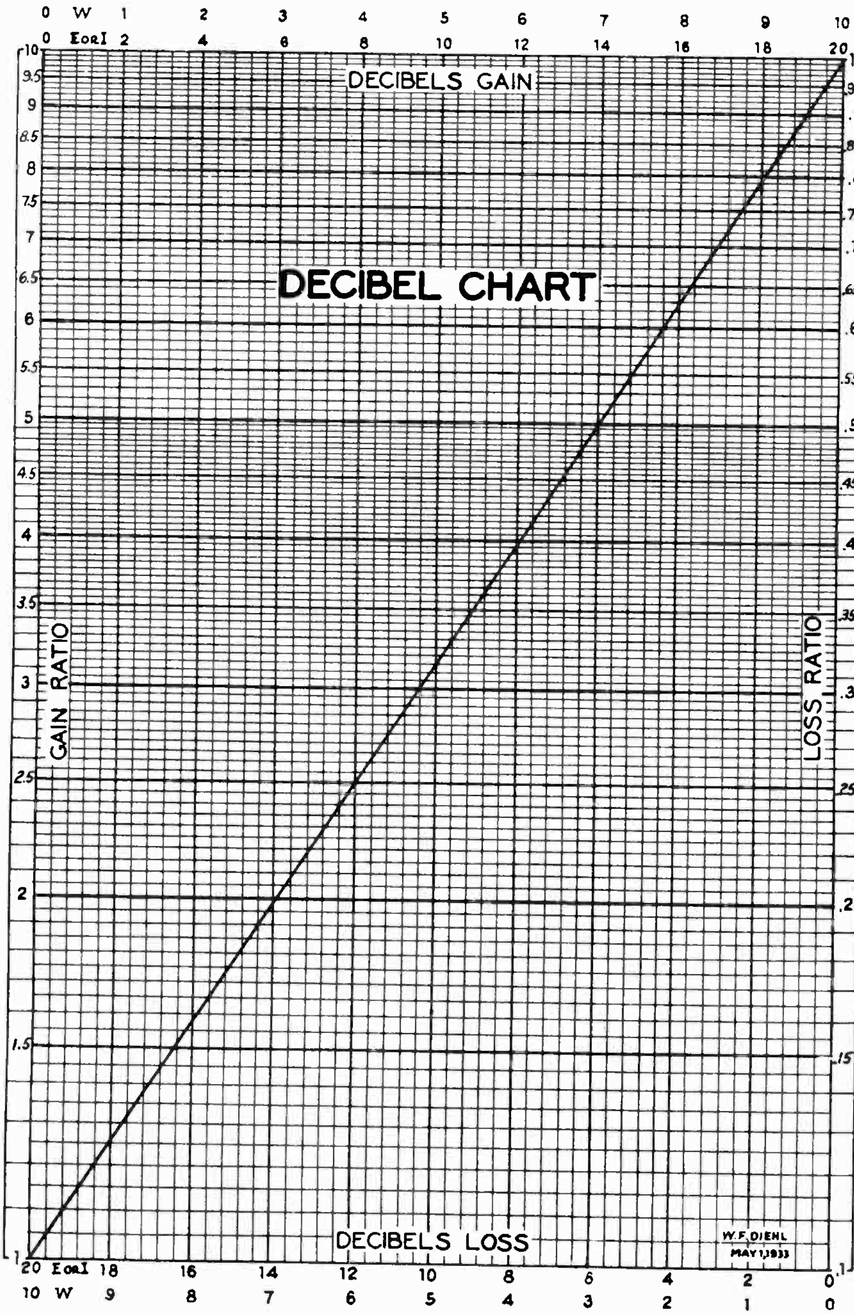


Fig. 3

Circuit No.	Condition	E_{c1}	E_{c2}	I_{c2}	I_b	E_b	E_{kf}	E_{c3}
1	Op	O	Lo	Hi	Hi	Lo	Hi	
* 2	Op	O	Nor	Hi	O	O	O	
† 3	Op	Hi	O	O	O	O	Hi	
4	Op	Hi	O	O	O	O	Hi	
5	S	O	Lo	Hi	Hi	Lo	O	
5	L	F or Lo	Nor	Nor	F or Hi	F or Lo	F or Lo	
5	Op	Nor	Nor	Nor	Nor	Nor	Nor	
‡ 6	S	Hi	O	O	O	O	Hi	
6	L	F or Hi	F or Lo	F or Lo	F or Lo	F or Lo	F or Hi	
6	Op	Nor	Nor	Nor	Nor	Nor	Nor	
‡ 7	S	Hi	O	O	O	Lo	Hi	
7	L	F or Hi	F or Lo	F or Lo	F or Lo	F or Lo	F or Hi	
7	Op	Nor	Nor	Nor	Nor	Nor	Nor	
8	Op	Hi	Hi	Hi	Hi	Hi	Hi	
9	Op	O	O	O	O	O	O	
10	S	O	O	O	O	O	O	
11	Op	Nor	Nor	Nor	Nor	Nor	Nor	Hum
12	Op	Nor	Nor	Nor	Nor	Nor	O	Hum
13	Op	O	O	O	O	Hi	O	
14	Op	Nor	Nor	Hi	Lo	Nor	Nor	Hi

Exceptions:

*E_{c1} = O when Individual Bias Resistor.
E_{c1} = Lo when Common Bias Resistor, or S. G. Tube.
†E_{c1} & E_{kf} = Hi when Individual Bias Resistor.
E_{c1} & E_{kf} = Lo when Common Bias Resistor.
‡E_{c1} & E_{kf} = O when condenser return is to neg. end No. 4 or Neg. Rectifier.



The Decibel

The decibel (db) 1/10 of the "bel" is a logarithmic unit which may be properly used to express power ratios and power levels only. It is the exact equivalent of the term "Transmission Unit" (TU) which is now obsolete, and is most useful for expressing the relation of the power output to the power input of devices in a communication system, since the overall power gain of the system may be readily obtained by adding algebraically the db gain of the individual devices comprising the entire network or system. When the power output is greater than the power input, the device acts as a repeater or amplifier and there results a transmission gain. When the power output is less than the power input, the device acts as an attenuator and there results a transmission loss.

The number of decibels (N db) by which two amounts of power differ may be expressed as follows:

$N\,db = 10\,Log_{10} \frac{P_0}{P_i}$ where P_0 = power output and P_i = power input. If voltage instead of power is used, then

$$N\,db = 20\,Log_{10} \frac{E_0}{E_i} + 10\,Log_{10} \frac{Z_i}{Z_0} + 10\,Log_{10} \frac{Cos_0\,\Theta}{Cos_i\,\Theta}$$

For current instead of voltage

$$N\,db = 20\,Log_{10} \frac{I_0}{I_i} + 10\,Log_{10} \frac{Z_0}{Z_i} + 10\,Log_{10} \frac{Cos_0\,\Theta}{Cos_i\,\Theta}$$

Where I_0, E_0, $\angle_0$, $Cos_0\,\Theta$ = the output, current, voltage, impedance and power factor respectively and I_i, E_i, Z_i, $Cos_i\,\Theta$ = the input current, voltage, impedance, and power factor respectively.

In order to save considerable time in solving the equations the chart shown herewith has been prepared.

Instructions for Using the Decibel Chart

Assume the power output of a device is twice the power input. The power output being greater than the power input, the quantity 2 is located on the left of the chart, on the "Gain Ratio" Scale. Where the horizontal 2 line joins the diagonal line, the gain in dbs is located at the top of the chart opposite the column marked "W." In this example the gain is found to be 3 db. If the ratio were 20 instead of 2, then 10 db would be added, making a total of 13 db. If the power output were less than the input, the ratio would be found on the scale marked "Loss Ratio" and the number of dbs (negative) would be located at the bottom of the chart as indicated on the "DECIBELS LOSS" scale opposite the column marked "W." For example, a loss ratio of 0.50 corresponds to a loss of 3 dbs. A loss ratio of .050 would correspond to a loss of 13 dbs.

When voltage or current is used instead of power, the chart is used in a similar manner with the exception that the scales marked "E or I" are used instead of the scale "W." In this case, when the gain or loss ratio is outside the range of the chart, it is necessary to add 20 db for each power of 10 for power gains, and add minus 20 db for each negative power of 10 for power loss. In using the final complete formula, the number of decibels should first be determined for the voltage or current ratio, then the correction for the impedance mismatch determined from the chart by assuming the impedance ratio to be a power ratio. If a correction is still required for power factor, this can also be obtained from the chart by assuming the power factor ratio to be a power ratio.

NOTE: As the ear is a non-linear device the minimum change in intensity perceptible by the average human ear is not a constant, three (3) db as is generally stated, but varies from one-half (.50) db to eight (8) db depending on the intensity, the frequency and the waveform of the sound. I fthe sound is very loud, eighty (80) db above threshold, then the ear is approximately uniformly sensitive to a change in intensity as small as one-half (.50) db over the entire frequency range of 30 cycles to 10,000 cycles. However, if the sound is of very low intensity, five (5) db above threshold, then the ear is only sensitive to a minimum change of eight (8) db at low frequencies, three (3) db at medium frequencies and eight (8) db at high frequencies.

RCA RADIO TUBE CHART

RADIO TUBES

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	RATING FILAMENT OR HEATER VOLTS	RATING FILAMENT OR HEATER AMPERES	RATING PLATE MAX. VOLTS	RATING SCREEN MAX. VOLTS	USE Values to right give operating conditions and characteristics for indicated typical use	PLATE SUPPLY VOLTS	GRID BIAS ◆ VOLTS	SCREEN SUPPLY VOLTS	SCREEN CURRENT MA.	PLATE CURRENT MA.	A-C PLATE RESISTANCE OHMS	TRANSCONDUCTANCE (GRID-PLATE) µMHOS	AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
00-A	DETECTOR TRIODE	MEDIUM 4-PIN Bayonet	4D	4 11/16" x 1 11/16"	D-C FILAMENT	5.0	0.25	45	—	GRID LEAK DETECTOR	45	Grid Return to (−) Filament			1.5	30000	666	20	—	—	00-A
01-A	DETECTOR & AMPLIFIER	MEDIUM 4-PIN Bayonet	4D	4 11/16" x 1 11/16"	D-C FILAMENT	5.0	0.25	135	—	CLASS A AMPLIFIER	90 135	−4.5 −9.0	—	—	2.5 3.0	11000 10000	725 800	8.0 8.0	—	—	01-A
1A4	SUPER-CONTROL R-F AMPLIFIER PENTODE	SMALL 4-PIN	4M	4 11/16" x 1 9/16"	D-C FILAMENT	2.0	0.06	180	67.5	CLASS A AMPLIFIER	90 180	−3.0 min.	67.5 67.5	0.9 0.8	2.2 2.3	600000 1000000	720 750	435 750	—	—	1A4
1A6	PENTAGRID CONVERTER ●	SMALL 6-PIN	6L	4 11/16" x 1 9/16"	D-C FILAMENT	2.0	0.06	180	67.5	CONVERTER	135 180	−3.0 min.	67.5 67.5	2.5 2.4	1.2 1.3	400000 500000	Anode-Grid (#2): 180 max. volts, 2.3 ma. Oscillator-Grid (#1) Resistor ●. Conversion Conductance, 300 micromhos				1A6
1B4	R-F AMPLIFIER PENTODE	SMALL 4-PIN	4M	4 11/16" x 1 9/16"	D-C FILAMENT	2.0	0.06	180	67.5	CLASS A AMPLIFIER	90 180	−3.0 −3.0	67.5 67.5	0.7 0.6	1.6 1.7	1000000 1500000	600 650	550 1000	—	—	1B4
1B5/25S	DUPLEX-DIODE TRIODE	SMALL 6-PIN	6M	4 1/2" x 1 9/16"	D-C FILAMENT	2.0	0.06	135	—	CLASS A AMPLIFIER	135	−3.0	—	—	0.8	35000	575	20	—	—	1B5/25S
1C6	PENTAGRID CONVERTER ●	SMALL 6-PIN	6L	4 11/16" x 1 9/16"	D-C FILAMENT	2.0	0.12	180	67.5	CONVERTER	135 180	−3.0 min.	67.5 67.5	2.0 2.0	1.3 1.5	550000 750000	Anode-Grid (#2): 180 max. volts, 3.3 ma. Oscillator-Grid (#1) Resistor ●. Conversion Conductance, 325 micromhos				1C6
1F4	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	5K	4 11/16" x 1 13/16"	D-C FILAMENT	2.0	0.12	135	135	CLASS A AMPLIFIER	135	−4.5	135	2.6	8.0	200000	1700	340	16000	0.34	1F4
1F6	DUPLEX-DIODE PENTODE	SMALL 6-PIN	6W	4 11/16" x 1 9/16"	D-C FILAMENT	2.0	0.06	180	67.5	PENTODE UNIT AS R-F AMPLIFIER	180	−1.5	67.5	0.6	2.0	1000000	650	650	—	—	1F6
										PENTODE UNIT AS A-F AMPLIFIER	135 ✱	−2.0	Screen Supply, 135 volts applied through 0.8-megohm resistor. Grid Resistor,** 1.0 megohm. Voltage Gain, 46.								
1-V	HALF-WAVE RECTIFIER	SMALL 4-PIN	4G	4 1/2" x 1 9/16"	HEATER	6.3	0.3	—	—		Maximum A-C Plate Voltage 350 Volts, RMS Maximum D-C Output Current 50 Milliamperes										1-V
2A3	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	4D	5 5/8" x 2 1/16"	FILAMENT	2.5	2.5	250	—	CLASS A AMPLIFIER	250	−45.0	—	—	60.0	800	5250	4.2	2500	3.5	2A3
								300	—	PUSH-PULL CLASS AB₁ AMPLIFIER	300 300	Self-bias, 780 ohms −62 volts, fixed bias			80.0 80.0	—	—	—	5000 3000	10.0† 15.0†	
2A5	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	6B	4 11/16" x 1 13/16"	HEATER	2.5	1.75	—	—	AMPLIFIER	For other ratings and characteristics, refer to Type 42.										2A5
2A6	DUPLEX-DIODE HIGH-MU TRIODE	SMALL 6-PIN	6G	4 11/16" x 1 9/16"	HEATER	2.5	0.8	250	—	TRIODE UNIT AS AMPLIFIER	For other characteristics, refer to Type 75.										2A6
2A7	PENTAGRID CONVERTER ●	SMALL 7-PIN	7C	4 11/16" x 1 9/16"	HEATER	2.5	0.8	250	100	CONVERTER	For other characteristics, refer to Type 6A7.										2A7
2B7	DUPLEX-DIODE PENTODE	SMALL 7-PIN	7D	4 11/16" x 1 9/16"	HEATER	2.5	0.8	250	125	AMPLIFIER	For other characteristics, refer to Type 6B7.										2B7
5W4	FULL-WAVE RECTIFIER	SMALL OCTAL 5-PIN	5T	3 1/2" x 1 9/16"	FILAMENT	5.0	1.5	—	—		Maximum A-C Voltage per Plate 350 Volts, RMS Maximum D-C Output Current 110 Milliamperes										5W4
5Z3	FULL-WAVE RECTIFIER	MEDIUM 4-PIN	4C	5 5/8" x 2 1/16"	FILAMENT	5.0	3.0	—	—		Maximum A-C Voltage per Plate 500 Volts, RMS Maximum D-C Output Current 250 Milliamperes										5Z3
5Z4	FULL-WAVE RECTIFIER	SMALL OCTAL 5-PIN	5L	3 1/4" x 1 9/16"	HEATER	5.0	2.0	—	—		Maximum A-C Voltage per Plate 400 Volts, RMS Maximum D-C Output Current 125 Milliamperes										5Z4
6A4/LA	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	5B	4 11/16" x 1 13/16"	FILAMENT	6.3	0.3	180	180	CLASS A AMPLIFIER	100 180	−6.5 −12.0	100 180	1.6 3.9	9.0 22.0	83250 45500	1200 2200	100 100	11000 8000	0.31 1.40	6A4/LA
6A6	TWIN-TRIODE AMPLIFIER	MEDIUM 7-PIN #	7B	4 11/16" x 1 13/16"	HEATER	6.3	0.8	300	—	AMPLIFIER	For other characteristics, refer to Type 6N7.										6A6
6A7	PENTAGRID CONVERTER ●	SMALL 7-PIN	7C	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	100	CONVERTER	100 250	−3.0 min.	50 100	2.5 2.3	1.3 3.5	600000 360000	Anode-Grid (#2): 250 max. volts, 4.0 ma. Oscillator-Grid (#1) Resistor ●. Conversion Conductance, 520 micromhos				6A7
6A8	PENTAGRID CONVERTER ●	SMALL OCTAL 8-PIN	8A	3 1/4" x 1 9/16"	HEATER	6.3	0.3	250	100	CONVERTER	100 250	−3.0 min.	50 100	1.5 3.2	1.2 3.3	600000 360000	Anode-Grid (#2): 250 max. volts, 4.0 ma. Oscillator-Grid (#1) Resistor ●. Conversion Conductance, 500 micromhos				6A8
6B7	DUPLEX-DIODE PENTODE	SMALL 7-PIN	7D	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	125	PENTODE UNIT AS R-F AMPLIFIER	100 250	−3.0 −3.0	100 125	1.7 2.3	5.8 9.0	300000 650000	950 1125	285 730	—	—	6B7
										PENTODE UNIT AS A-F AMPLIFIER	90 ✱ 300 ✱	Self-bias, 3500 ohms. Screen Resistor = 1.1 meg. Self-bias, 1600 ohms. Screen Resistor = 1.2 meg.					Grid Resistor,** 0.5 megohm.		Gain per stage = 55 Gain per stage = 79		
6B8	DUPLEX-DIODE PENTODE	SMALL OCTAL 8-PIN	8E	3 1/4" x 1 9/16"	HEATER	6.3	0.3	250	125	PENTODE UNIT AS R-F AMPLIFIER	250	−3.0	125	2.3	10.0	600000	1325	800	—	—	6B8
										PENTODE UNIT AS A-F AMPLIFIER	90 ✱ 300 ✱	Self-bias, 3500 ohms. Screen Resistor = 1.1 meg. Self-bias, 1600 ohms. Screen Resistor = 1.2 meg.					Grid Resistor,** 0.5 megohm.		Gain per stage = 55 Gain per stage = 79		
6C5	DETECTOR & AMPLIFIER TRIODE	SMALL OCTAL 6-PIN	6Q	2 3/4" x 1 5/16"	HEATER	6.3	0.3	250	—	CLASS A AMPLIFIER	250 250 ▼	−8.0 −5.0	—	—	8.0 1.0	10000 Gain per stage = 14	2000	20	—	—	6C5
										BIAS DETECTOR	250	−17.0 approx.	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
6C6	TRIPLE-GRID DETECTOR AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	100	AMPLIFIER DETECTOR	For other characteristics, refer to Type 6J7.										6C6
6D6	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	100	SCREEN-GRID R-F AMPLIFIER	100 250	−3.0 min.	100 100	2.2 2.0	8.0 8.2	250000 800000	1500 1600	375 1280	—	—	6D6
										MIXER IN SUPERHETERODYNE	100 250	−10.0 −10.0	100 100	—	—	Oscillator Peak Volts = 7.0					
6E5	ELECTRON-RAY TUBE	SMALL 6-PIN	6R	4 1/4" x 1 9/16"	HEATER	6.3	0.3	250‡	—	VISUAL INDICATOR	Plate & Target Supply = 100 volts. Triode Plate Resistor = 0.5 meg. Target Current = 4.5 ma. Grid Bias, −3.3 volts; Shadow Angle, 0°. Bias, 0 volts; Angle, 90°. Plate Current, 0.19 ma. Plate & Target Supply = 250 volts. Triode Plate Resistor = 1.0 meg. Target Current = 4.5 ma. Grid Bias, −8.0 volts; Shadow Angle, 0°. Bias, 0 volts; Angle, 90°. Plate Current, 0.24 ma.										6E5
6F5	HIGH-MU TRIODE	SMALL OCTAL 5-PIN	5M	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	—	CLASS A AMPLIFIER	250 250 ✱	−3.0 −0.3	—	—	0.9 0.4	66000 Grid Resistor, 0.25 meg.**	1500	100 Gain per stage = 52	—	—	6F5
6F6	POWER AMPLIFIER PENTODE	SMALL OCTAL 7-PIN	7S	3 1/4" x 1 5/16"	HEATER	6.3	0.7	315	315	PENTODE CLASS A AMPLIFIER	250 315	−16.5 −22.0	250 315	6.5 8.0	34.0 42.0	80000 75000	2500 2650	200 200	7000 7000	3.0 5.0	6F6
								250	—	TRIODE ◻ CLASS A AMPLIFIER	250	−20.0	—	—	31.0	2600	2700	7	4000	0.85	
								375	250	PENTODE PUSH-PULL CLASS AB₂ AMPLIFIER	375 375	Self-bias −26.0	250 250	8.0 5.0	54.0 34.0	Self-Bias Resistor, 340 ohms			10000 10000	19.0† 19.0†	
								350	—	TRIODE PUSH-PULL ◻ CLASS AB₂ AMPLIFIER	350 350	Self-bias −38.0	—	—	50.0 45.0	Self-Bias Resistor, 730 ohms			10000 6000	14.0† 18.[illegible]	
6F7	TRIODE-PENTODE	SMALL 7-PIN	7E	4 11/16" x 1 9/16"	HEATER	6.3	0.3	100	—	TRIODE UNIT AS CLASS A AMPLIFIER	100	−3.0	—	—	3.5	16000	500	8	—	—	6F7
								250	100	PENTODE UNIT AS CLASS A AMPLIFIER	100 250	−3.0 min.	100 100	1.6 1.5	6.3 6.5	290000 850000	1050 1100	300 900	—	—	
								250	100	PENTODE UNIT AS MIXER	250	−10.0	100	0.6	2.8	Oscillator Peak Volts = 7.0. Conversion Conductance = 300 micromhos.					
6G5	ELECTRON-RAY TUBE	SMALL 6-PIN	6R	4 1/4" x 1 9/16"	HEATER	6.3	0.3	250‡	—	VISUAL INDICATOR	Plate & Target Supply = 100 volts. Triode Plate Resistor = 0.5 meg. Target Current = 4.5 ma. Grid Bias, −8 volts; Shadow Angle, 0°. Bias, 0 volts; Angle, 90°; Plate Current, 0.19 ma. Plate & Target Supply = 250 volts. Triode Plate Resistor = 1.0 meg. Target Current = 4.5 ma. Grid Bias, −22 volts; Shadow Angle, 0°. Bias, 0 volts; Angle, 90°. Plate Current, 0.24 ma.										6G5
6H6	TWIN DIODE	SMALL OCTAL 7-PIN	7Q	1 5/8" x 1 5/16"	HEATER	6.3	0.3	—	—	TWIN-DIODE DETECTOR RECTIFIER	Maximum A-C Voltage per Plate 100 Volts, RMS Maximum D-C Output Current 4 Milliamperes										6H6
6J7	TRIPLE-GRID DETECTOR AMPLIFIER	SMALL OCTAL 7-PIN	7R	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	125	SCREEN-GRID R-F AMPLIFIER	100 250	−3.0 −3.0	100 100	0.5 0.5	2.0 2.0	1000000 1.5 + ‡	1185 1225	1185 1500 +	—	—	6J7
										SCREEN-GRID A-F AMPLIFIER	90 ✱ 300 ✱	Self-bias, 2600 ohms. Screen Resistor = 1.2 meg. Self-bias, 1200 ohms. Screen Resistor = 1.2 meg.					Grid Resistor,** 0.5 megohm.		Gain per stage = 85 Gain per stage = 140		
										BIAS DETECTOR	250	−4.3	100	Cathode current 0.43 ma.		—	Plate Resistor, 500000 ohms. Grid Resistor,** 250000 ohms.				
6K7	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL OCTAL 7-PIN	7R	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	125	SCREEN-GRID R-F AMPLIFIER	90 250	−3.0 min.	90 125	1.3 2.6	5.4 10.5	315000 600000	1275 1650	400 990	—	—	6K7
										MIXER IN SUPERHETERODYNE	250	−10.0	100	—	—	Oscillator Peak Volts = 7.0					
6L6	BEAM POWER AMPLIFIER	SMALL OCTAL 7-PIN	7AC	4 1/4" x 1 5/8"	HEATER	6.3	0.9	375	250	SINGLE-TUBE CLASS A₁ AMPLIFIER	250 250	−14.0 Self-bias	250 250	5.0 5.4	72.0 75.0	— Self-Bias Resistor, 170 ohms.			2500 2500	6.5 6.5	6L6
								375	250	PUSH-PULL CLASS A₁ AMPLIFIER	250 250	−16.0 Self-bias	250 250	10.0 10.0	120.0 120.0	— Self-Bias Resistor, 125 ohms.			5000 5000	14.5† 13.8†	
								400	300	PUSH-PULL CLASS AB₁ AMPLIFIER	400 400	−25.0 Self-bias	300 300	6.0 7.0	102.0 112.0	— Self-Bias Resistor, 200 ohms.			6600 6500	34.0† 32.0†	
								400	300	PUSH-PULL CLASS AB₂ AMPLIFIER	400 400	−20.0 −25.0	250 300	4.0 6.0	88.0 102.0	—	—	—	6000 3800	40.0† 60.0†	
6L7	PENTAGRID MIXER & AMPLIFIER	SMALL OCTAL 7-PIN	7T	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	150	MIXER IN SUPERHETERODYNE	250	−3.0	100	6.2	2.4	Oscillator-Grid (#3) Bias, −10 volts. Grid #3 Peak Swing, 12 volts min. Conversion Conductance, 350 micromhos.					6L7
								250	100	CLASS A AMPLIFIER	250	−3.0 min.◆	100	5.5	5.3	800000	2100	880	—	—	
6N7	TWIN-TRIODE AMPLIFIER	SMALL OCTAL 8-PIN	8B	3 1/4" x 1 5/16"	HEATER	6.3	0.8	300	—	CLASS A AMPLIFIER (As Driver)●	250 294	−5.0 −6.0	—	—	6.0 7.0	11300 11000	3100 3200	35 35	20000 or more	exceeds 0.4	6N7
										CLASS B AMPLIFIER	250 300	0 0	—	—	Power Output is for one tube at stated plate-to-plate load.				8000 10000	8.0 10.0	
6Q7	DUPLEX-DIODE HIGH-MU TRIODE	SMALL OCTAL 7-PIN	7V	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	—	TRIODE UNIT AS CLASS A AMPLIFIER	100 250	−1.5 −3.0	—	—	0.35 1.1	87500 58000	800 1200	70 70	—	—	6Q7
											100●● 250■	−1.1 −2.0	—	—	0.25 0.5	Grid Resistor,** 0.5 megohm		Gain per stage = 35 Gain per stage = 43			
6R7	DUPLEX-DIODE TRIODE	SMALL OCTAL 7-PIN	7V	3 1/4" x 1 5/16"	HEATER	6.3	0.3	250	—	TRIODE UNIT AS CLASS A AMPLIFIER	250 250 ▼	−9.0 −4.0	—	—	9.5 1.3	8500 Grid Resistor,** 0.3 meg.	1900	16 Gain per stage = 12	10000	0.28	6R7
6X5	FULL-WAVE RECTIFIER	SMALL OCTAL 6-PIN	6S	3 1/4" x 1 5/16"	HEATER	6.3	0.6	—	—		Maximum A-C Voltage per Plate 350 Volts, RMS Maximum D-C Output Current 75 Milliamperes										6X5
10	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN Bayonet	4D	5 5/8" x 2 3/16"	FILAMENT	7.5	1.25	425	—	CLASS A AMPLIFIER	350 425	−32.0 −40.0	—	—	16.0 18.0	5150 5000	1550 1600	8.0 8.0	11000 10200	0.9 1.6	10
11 12	DETECTOR & AMPLIFIER TRIODE	WD 4-PIN MEDIUM 4-PIN Bayonet	4F 4D	4 1/2" x 1 3/16" 4 11/16" x 1 13/16"	D-C FILAMENT	1.1	0.25	135	—	CLASS A AMPLIFIER	90 135	−4.5 −10.5	—	—	2.5 3.0	15500 15000	425 440	6.6 6.6	—	—	11 12
12Z3	HALF-WAVE RECTIFIER	SMALL 4-PIN	4G	4 1/2" x 1 9/16"	HEATER	12.6	0.3	—	—		Maximum A-C Plate Voltage 250 Volts, RMS Maximum D-C Output Current 60 Milliamperes										12Z3
15	R-F AMPLIFIER PENTODE	SMALL 5-PIN	5F	4 11/16" x 1 9/16"	HEATER	2.0	0.22	135	67.5	CLASS A AMPLIFIER	67.5 135	−1.5 −1.5	67.5 67.5	0.3 0.3	1.85 1.85	630000 800000	710 750	450 600	—	—	15
19	TWIN-TRIODE AMPLIFIER	SMALL 6-PIN	6C	4 1/2" x 1 9/16"	D-C FILAMENT	2.0	0.26	135	—	CLASS B AMPLIFIER	135 135	0 −3.0	—	—	Power Output is for one tube at stated plate-to-plate load.				10000 10000	2.1 1.9	19
20	POWER AMPLIFIER TRIODE	SMALL 4-PIN	4D	4 1/2" x 1 3/16"	D-C FILAMENT	3.3	0.132	135	—	CLASS A AMPLIFIER	90 135	−16.5 −22.5	—	—	3.0 6.5	8000 6300	415 525	3.3 3.3	9600 6500	0.045 0.110	20
22	R-F AMPLIFIER TETRODE	MEDIUM 4-PIN	4K	5 5/16" x 1 13/16"	D-C FILAMENT	3.3	0.132	135	67.5	SCREEN-GRID R-F AMPLIFIER	135 135	−1.5 −1.5	45 67.5	0.6* 1.3*	1.7 3.7	725000 325000	375 500	270 160	—	—	22
24-A	R-F AMPLIFIER TETRODE	MEDIUM 5-PIN	5E	5 5/16" x 1 13/16"	HEATER	2.5	1.75	275	90	SCREEN-GRID R-F AMPLIFIER	180 250	−3.0 −3.0	90 90	1.7* 1.7*	4.0 4.0	400000 600000	1000 1050	400 630	—	—	24-A
										BIAS DETECTOR	250●	−5.0 approx.	20 to 45	—	Plate current to be adjusted to 0.1 milliampere with no signal.						
25A6	POWER AMPLIFIER PENTODE	SMALL OCTAL 7-PIN	7S	3 1/4" x 1 5/16"	HEATER	25.0	0.3	180	135	CLASS A AMPLIFIER	95 180	−15.0 −20.0	95 135	4.0 7.5	20.0 38.0	45000 40000	2000 2500	90 100	4500 5000	0.9 2.75	25A6
25Z5	RECTIFIER-DOUBLER	SMALL 6-PIN	6E	4 1/2" x 1 9/16"	HEATER	25.0	0.3	—	—	VOLTAGE DOUBLER	Maximum A-C Voltage per Plate 125 Volts, RMS Maximum D-C Output Current 100 Milliamperes										25Z5
										HALF-WAVE RECTIFIER	Maximum A-C Voltage per Plate ¶ 250 Volts, RMS Maximum D-C Output Current per Plate 85 Milliamperes										
25Z6	RECTIFIER-DOUBLER	SMALL OCTAL 7-PIN	7Q	3 1/4" x 1 5/16"	HEATER	25.0	0.3	—	—	VOLTAGE DOUBLER	Maximum A-C Voltage per Plate 125 Volts, RMS Maximum D-C Output Current 85 Milliamperes										25Z6
										HALF-WAVE RECTIFIER	Maximum A-C Voltage per Plate ¶ 250 Volts, RMS Maximum D-C Output Current per Plate 85 Milliamperes										
26	AMPLIFIER TRIODE	MEDIUM 4-PIN	4D	4 11/16" x 1 13/16"	FILAMENT	1.5	1.05	180	—	CLASS A AMPLIFIER	90 180	−7.0 −14.5	—	—	2.9 6.2	8900 7300	935 1150	8.3 8.3	—	—	26
27	DETECTOR & AMPLIFIER TRIODE	MEDIUM 5-PIN	5A	4 1/4" x 1 9/16"	HEATER	2.5	1.75	275	—	CLASS A AMPLIFIER	135 250	−9.0 −21.0	—	—	4.5 5.2	9000 9250	1000 975	9.0 9.0	—	—	27
										BIAS DETECTOR	250	−30.0 approx.	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
30	DETECTOR & AMPLIFIER TRIODE	SMALL 4-PIN	4D	4 1/4" x 1 9/16"	D-C FILAMENT	2.0	0.06	180	—	CLASS A AMPLIFIER	90 135 180	−4.5 −9.0 −13.5	—	—	2.5 3.0 3.1	11000 10300 10300	850 900 900	9.3 9.3 9.3	—	—	30
										CLASS B AMPLIFIER	157.5	−15.0	—	—	1.0	—	—	—	8000	2.1†	

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	FILAMENT OR HEATER VOLTS	FILAMENT OR HEATER AMPERES	PLATE MAX. VOLTS	SCREEN MAX. VOLTS	USE Values to right give operating conditions and characteristics for indicated typical use	PLATE SUPPLY VOLTS	GRID BIAS ◎ VOLTS	SCREEN SUPPLY VOLTS	SCREEN CURRENT MA.	PLATE CURRENT MA.	A-C PLATE RESISTANCE OHMS	TRANSCONDUCTANCE (GRID-PLATE) µMHOS	AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
31	POWER AMPLIFIER TRIODE	SMALL 4-PIN	4D	4 1/2" x 1 9/16"	D-C FILAMENT	2.0	0.13	180	—	CLASS A AMPLIFIER	135 180	−22.5 −30.0	—	—	8.0 12.3	4100 3600	925 1050	3.8 3.8	7000 5700	0.185 0.375	31
32	R-F AMPLIFIER TETRODE	MEDIUM 4-PIN	4K	5 5/16" x 1 13/16"	D-C FILAMENT	2.0	0.06	180	67.5	SCREEN-GRID R-F AMPLIFIER	135 180	−3.0 −3.0	67.5 67.5	0.4* 0.4*	1.7 1.7	950000 1200000	640 650	610 780	—	—	32
										BIAS DETECTOR	180♥	−6.0 approx.	67.5	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
33	POWER AMPLIFIER PENTODE	MEDIUM 4-PIN	5K	4 11/16" x 1 13/16"	D-C FILAMENT	2.0	0.26	180	180	CLASS A AMPLIFIER	180	−18.0	180	5.0	22.0	55000	1700	90	6000	1.4	33
34	SUPER-CONTROL R-F AMPLIFIER PENTODE	MEDIUM 4-PIN	4M	5 5/16" x 1 13/16"	D-C FILAMENT	2.0	0.06	180	67.5	SCREEN-GRID R-F AMPLIFIER	135 180	−3.0 min.	67.5 67.5	1.0 1.0	2.8 2.8	600000 1000000	600 620	360 620	—	—	34
35	SUPER-CONTROL R-F AMPLIFIER TETRODE	MEDIUM 5-PIN	5E	5 5/16" x 1 13/16"	HEATER	2.5	1.75	275	90	SCREEN-GRID R-F AMPLIFIER	180 250	−3.0 min.	90 90	2.5* 2.5*	6.5 6.5	300000 400000	1020 1050	305 420	—	—	35
36	R-F AMPLIFIER TETRODE	SMALL 5-PIN	5E	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	90	SCREEN-GRID R-F AMPLIFIER	100 250	−1.5 −3.0	55 90	— 1.7*	1.8 3.2	550000 550000	850 1080	470 595	—	—	36
										BIAS DETECTOR	100● 250●	−5.0 −8.0	55 90	—	Grid-bias values are approximate. Plate current to be adjusted to 0.1 milliampere with no signal.						
37	DETECTOR* AMPLIFIER TRIODE	SMALL 5-PIN	5A	4 1/4" x 1 9/16"	HEATER	6.3	0.3	250	—	CLASS A AMPLIFIER	90 250	−6.0 −18.0	—	—	2.5 7.5	11500 8400	800 1100	9.2 9.2	—	—	37
										BIAS DETECTOR	90 250	−10.0 −28.0	—	—	Grid-bias values are approximate. Plate current to be adjusted to 0.2 milliampere with no signal.						
38	POWER AMPLIFIER PENTODE	SMALL 5-PIN	5F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	250	CLASS A AMPLIFIER	100 250	−9.0 −25.0	100 250	1.2 3.8	7.0 22.0	140000 100000	875 1200	120 120	15000 10000	0.27 2.50	38
39/44	SUPER-CONTROL R-F AMPLIFIER PENTODE	SMALL 5-PIN	5F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	90	SCREEN-GRID R-F AMPLIFIER	90 250	−3.0 min.	90 90	1.6 1.4	5.6 5.8	375000 1000000	960 1050	360 1050	—	—	39/44
40	VOLTAGE AMPLIFIER TRIODE	MEDIUM 4-PIN Bayonet	4D	4 11/16" x 1 13/16"	D-C FILAMENT	5.0	0.25	180	—	CLASS A AMPLIFIER	135¤ 180¤	−1.5 −3.0	—	—	0.2 0.2	150000 150000	200 200	30 30	—	—	40
41	POWER AMPLIFIER PENTODE	SMALL 6-PIN	6B	4 1/4" x 1 9/16"	HEATER	6.3	0.4	250	250	CLASS A AMPLIFIER	100 250	−7.0 −18.0	100 250	1.6 5.5	9.0 32.0	103500 68000	1450 2200	150 150	12000 7600	0.33 3.40	41
42	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	6B	4 11/16" x 1 13/16"	HEATER	6.3	0.7	315	315	PENTODE CLASS A AMPLIFIER	250 315	−16.5 −22.0	250 315	6.5 8.0	34.0 42.0	80000 100000	2350 2600	190 260	7000 7000	3.0 5.0	42
								315	—	TRIODE □ CLASS A AMPLIFIER	250	−20.0	—	—	31.0	2700	2300	6.2	3000	0.65	
								375	250	PENTODE PUSH-PULL CLASS AB1 AMPLIFIER	375 375	Self-bias −26.0	250 250	8.0 5.0	54.0 34.0	Self-Bias Resistor, 340 ohms	—	—	10000 10000	19.0† 19.0†	
								350	—	TRIODE PUSH-PULL □ CLASS AB2 AMPLIFIER	350 350	Self-bias, 730 ohms −38.0 volts, fixed bias			50.0 45.0	—	—	—	10000 6000	14.0† 18.0†	
43	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	6B	4 11/16" x 1 13/16"	HEATER	25.0	0.3	180	135	CLASS A AMPLIFIER	95 180	−15.0 −20.0	95 135	4.0 7.5	20.0 38.0	45000 40000	2000 2500	90 100	4500 5000	0.90 2.75	43
45	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	4D	4 11/16" x 1 13/16"	FILAMENT	2.5	1.5	275	—	CLASS A AMPLIFIER	180 275	−31.5 −56.0	—	—	31.0 36.0	1650 1700	2125 2050	3.5 3.5	2700 4600	0.82 2.00	45
										CLASS AB2 AMPLIFIER	275 275	Self-bias, 775 ohms −68.0 volts, fixed bias			72.0 28.0	—	—	—	5060 3200	12.0† 18.0†	
46	DUAL-GRID POWER AMPLIFIER	MEDIUM 5-PIN	5C	5 5/8" x 2 3/16"	FILAMENT	2.5	1.75	250	—	CLASS A AMPLIFIER □	250	−33.0	—	—	22.0	2380	2350	5.6	6400	1.25	46
								400	—	CLASS B AMPLIFIER ◆	300 400	0 0	—	—	8.0 12.0	—	—	—	5200 5800	16.0† 20.0†	
47	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	5B	5 5/8" x 2 3/16"	FILAMENT	2.5	1.75	250	250	CLASS A AMPLIFIER	250	−16.5	250	6.0	31.0	60000	2500	150	7000	2.7	47
48	POWER AMPLIFIER TETRODE	MEDIUM 6-PIN	6A	5 5/8" x 2 3/16"	D-C HEATER	30.0	0.4	125	100	TETRODE CLASS A AMPLIFIER	96 125	−19.0 −20.0	96 100	9.0 9.5	52.0 56.0	—	3800 3900	—	1500 1500	2.0 2.5	48
										TETRODE PUSH-PULL CLASS A AMPLIFIER	125	−20.0	100	—	100.0	—	—	—	3000	5.0†	
49	DUAL-GRID POWER AMPLIFIER	MEDIUM 5-PIN	5C	4 11/16" x 1 13/16"	D-C FILAMENT	2.0	0.12	135	—	CLASS A AMPLIFIER □	135	−20.0	—	—	6.0	4175	1125	4.7	11000	0.17	49
								180	—	CLASS B AMPLIFIER ◆	180	0	—	—	4.0	—	—	—	12000	3.5†	
50	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN Bayonet	4D	6 1/4" x 2 7/16"	FILAMENT	7.5	1.25	450	—	CLASS A AMPLIFIER	300 400 450	−54.0 −70.0 −84.0	—	—	35.0 55.0 55.0	2000 1800 1800	1900 2100 2100	3.8 3.8 3.8	4600 3670 4350	1.6 3.4 4.6	50
53	TWIN-TRIODE AMPLIFIER	MEDIUM 7-PIN#	7B	4 11/16" x 1 13/16"	HEATER	2.5	2.0	300	—	AMPLIFIER	For other characteristics, refer to Type 6N7.										53
55	DUPLEX-DIODE TRIODE	SMALL 6-PIN	6G	4 11/16" x 1 9/16"	HEATER	2.5	1.0	250	—	TRIODE UNIT AS AMPLIFIER	For other characteristics, refer to Type 85.										55
56	SUPER-TRIODE AMPLIFIER DETECTOR*	SMALL 5-PIN	5A	4 1/4" x 1 9/16"	HEATER	2.5	1.0	250	—	AMPLIFIER DETECTOR	For other characteristics, refer to Type 76.										56
57	TRIPLE-GRID DETECTOR AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	2.5	1.0	250	100	AMPLIFIER DETECTOR	For other characteristics, refer to Type 6J7.										57
58	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	2.5	1.0	250	100	AMPLIFIER MIXER	For other characteristics, refer to Type 6D6.										58
59	TRIPLE-GRID POWER AMPLIFIER	MEDIUM 7-PIN#	7A	5 5/8" x 2 3/16"	HEATER	2.5	2.0	250	—	TRIODE * CLASS A AMPLIFIER	250	−28.0	—	—	26.0	2300	2600	6.0	5000	1.25	59
								250	250	PENTODE ** CLASS A AMPLIFIER	250	−18.0	250	9.0	35.0	40000	2500	100	6000	3.0	
								400	—	TRIODE ● CLASS B AMPLIFIER	300 400	0 0	—	—	20.0 26.0	—	—	—	4600 6000	15.0† 20.0†	
71-A	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN Bayonet	4D	4 11/16" x 1 13/16"	FILAMENT	5.0	0.25	180	—	CLASS A AMPLIFIER	90 180	−19.0 −43.0	—	—	10.0 20.0	2170 1750	1400 1700	3.0 3.0	3000 4800	0.125 0.790	71-A
75	DUPLEX-DIODE HIGH-MU TRIODE	SMALL 6-PIN	6G	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	—	TRIODE UNIT AS CLASS A AMPLIFIER	250¤	−1.35	—	—	0.4	—	—	Gain per stage = 50-60			75
76	SUPER-TRIODE AMPLIFIER DETECTOR*	SMALL 5-PIN	5A	4 1/4" x 1 9/16"	HEATER	6.3	0.3	250	—	CLASS A AMPLIFIER	100 250 250♥	−5.0 −13.5 −9.0	—	—	2.5 5.0 1.0	12000 9500	1150 1450	13.8 13.8	—	—	76
										BIAS DETECTOR	250	−20.0 approx.	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
77	TRIPLE-GRID DETECTOR AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	100	SCREEN-GRID R-F AMPLIFIER	100 250	−1.5 −3.0	60 100	0.4 0.5	1.7 2.3	650000 1500000	1100 1250	715 1500	—	—	77
										BIAS DETECTOR	250	−1.95	50	Cathode current 0.65 ma.		—	Plate Resistor, 250000 ohms. Grid Resistor,** 250000 ohms.				
78	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	125	AMPLIFIER MIXER	For other characteristics, refer to Type 6K7.										78
79	TWIN-TRIODE AMPLIFIER	SMALL 6-PIN	6H	4 11/16" x 1 9/16"	HEATER	6.3	0.6	250	—	CLASS B AMPLIFIER	180 250	0 0	—	—	Power Output is for one tube at stated plate-to-plate load.				7000 14000	5.5 8.0	79
80	FULL-WAVE RECTIFIER	MEDIUM 4-PIN	4C	4 11/16" x 1 13/16"	FILAMENT	5.0	2.0	—	—	A-C Voltage per Plate (Volts RMS) .... 350 400 550 D-C Output Current (Maximum MA.) 125 110 135	The 550-volt rating applies to filter circuits having an input choke of at least 20 henries.										80
81	HALF-WAVE RECTIFIER	MEDIUM 4-PIN Bayonet	4B	6 1/4" x 2 3/16"	FILAMENT	7.5	1.25	—	—	Maximum A-C Plate Voltage .... 700 Volts, RMS Maximum D-C Output Current .... 85 Milliamperes											81
82	FULL-WAVE ▸ RECTIFIER	MEDIUM 4-PIN	4C	4 11/16" x 1 13/16"	FILAMENT	2.5	3.0	—	—	Maximum A-C Voltage per Plate ..... 500 Volts, RMS Maximum D-C Output Current ..... 125 Milliamperes	Maximum Peak Inverse Voltage ..... 1400 Volts Maximum Peak Plate Current ..... 400 Milliamperes										82
83	FULL-WAVE ▸ RECTIFIER	MEDIUM 4-PIN	4C	5 5/8" x 2 3/16"	FILAMENT	5.0	3.0	—	—	Maximum A-C Voltage per Plate ..... 500 Volts, RMS Maximum D-C Output Current ..... 250 Milliamperes	Maximum Peak Inverse Voltage ..... 1400 Volts Maximum Peak Plate Current ..... 800 Milliamperes										83
83-v	FULL-WAVE RECTIFIER	MEDIUM 4-PIN	4L	4 11/16" x 1 13/16"	HEATER	5.0	2.0	—	—	Maximum A-C Voltage per Plate .... 400 Volts, RMS Maximum D-C Output Current .... 200 Milliamperes											83-v
84/6Z4	FULL-WAVE RECTIFIER	SMALL 5-PIN	5D	4 1/4" x 1 9/16"	HEATER	6.3	0.5	—	—	Maximum A-C Voltage per Plate .... 350 Volts, RMS Maximum D-C Output Current .... 60 Milliamperes											84/6Z4
85	DUPLEX-DIODE TRIODE	SMALL 6-PIN	6G	4 11/16" x 1 9/16"	HEATER	6.3	0.3	250	—	TRIODE UNIT AS CLASS A AMPLIFIER	135 250	−10.5 −20.0	—	—	3.7 8.0	11000 7500	750 1100	8.3 8.3	25000 20000	0.075 0.350	85
89	TRIPLE-GRID POWER AMPLIFIER	SMALL 6-PIN	6F	4 11/16" x 1 9/16"	HEATER	6.3	0.4	250	—	AS TRIODE ¶ CLASS A AMPLIFIER	160 250	−20.0 −31.0	—	—	17.0 32.0	3300 2600	1425 1800	4.7 4.7	7000 5500	0.30 0.90	89
								250	250	AS PENTODE ** CLASS A AMPLIFIER	100 250	−10.0 −25.0	100 250	1.6 5.5	9.5 32.0	104000 70000	1200 1800	125 125	10700 6750	0.33 3.40	
								250	—	AS TRIODE ● CLASS B AMPLIFIER	180	0	—	—	6.0	—	—	—	13600 9400	2.50† 3.50†	
V-99 X-99	DETECTOR* AMPLIFIER TRIODE	SMALL 4-NUB SMALL 4-PIN	4E 4D	3 1/2" x 1 3/16" 4" x 1 3/16"	D-C FILAMENT	3.3	0.063	90	—	CLASS A AMPLIFIER	90	−4.5	—	—	2.5	15500	425	6.6	—	—	V-99 X-99
112-A	DETECTOR* AMPLIFIER TRIODE	MEDIUM 4-PIN Bayonet	4D	4 11/16" x 1 13/16"	D-C FILAMENT	5.0	0.25	180	—	CLASS A AMPLIFIER	90 180	−4.5 −13.5	—	—	5.0 7.7	5400 4700	1575 1800	8.5 8.5	—	—	112-A
874	VOLTAGE REGULATOR	MEDIUM 4-PIN Bayonet	4S	5 5/8" x 2 3/16"	—	—	—	—	—	Minimum D-C Starting Supply Voltage .... 125 Volts D-C Operating Voltage .... 90 Volts	D-C Operating Current .... 10-50 Ma. Maximum Current (Continuous) .... 50 Ma.										874
876	CURRENT REGULATOR	MOGUL SCREW	—	8" x 2 1/16"	FILAMENT	—	—	—	—	Voltage Range .... 40 to 60 Volts	Operating Current .... 1.7 Amperes										876
886	CURRENT REGULATOR	MOGUL SCREW	—	8" x 2 1/16"	FILAMENT	—	—	—	—	Voltage Range .... 40 to 60 Volts	Operating Current .... 2.05 Amperes										886

✱ For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode
■ Either A. C. or D. C. may be used on filament or heater, except as specifically noted. For use of D.C. on A-C filament types, decrease stated grid volts by ½ (approx.) of filament voltage.
⁂ Supply voltage applied through 20000-ohm voltage-dropping resistor.
▸ Mercury-Vapor Type.
** Grid #1 is control grid. Grid #2 is screen. Grid #3 tied to cathode.
¶ Grid #1 is control grid. Grids #2 and #3 tied to plate.
● Grids #1 and #2 connected together. Grid #3 tied to plate.
■ Grids #3 and #5 are screen. Grid #4 is signal-input control grid.
▲ Grids #2 and #4 are screen. Grid #1 is signal-input control grid.
✢ Triode Plate-Supply Voltage and Max. Target Voltage. Min. Target Voltage = 90 volts.
● Both grids connected together; likewise, both plates.
† Power output is for two tubes at stated plate-to-plate load.

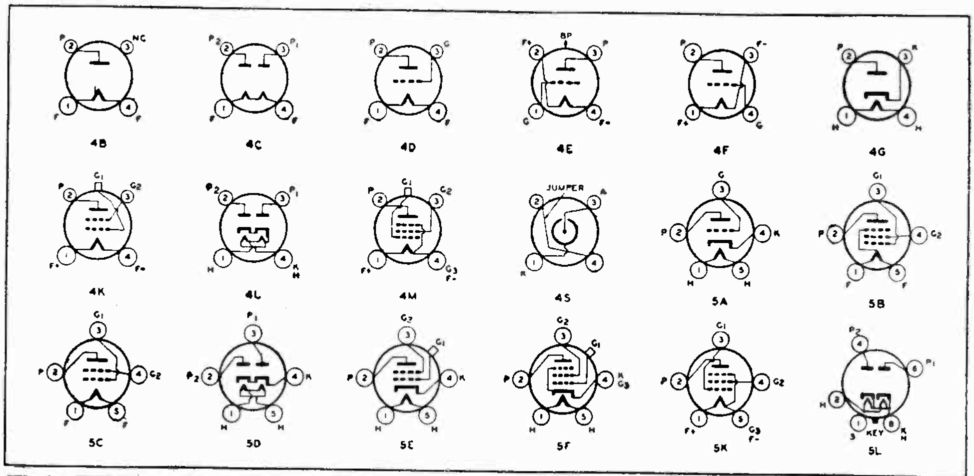
● Applied through plate resistor of 250000 ohms or 500-henry choke shunted by 0.25-megohm resistor.
♥ Applied through plate resistor of 100000 ohms.
¤ Applied through plate resistor of 250000 ohms.
⁂ 50000 ohms.
\# Requires different socket from small 7-pin.
□ Grid #2 tied to plate. ◆ Grids #1 and #2 tied together. ** For grid of following tube.
❡ Plate voltages greater than 125 volts RMS require 100-ohm series-plate resistor.
●● Applied through plate resistor of 150000 ohms.
◖ For signal-input control-grid (#1); control-grid #3 bias, −3 volts.
▦ Applied through 200000-ohm plate resistor.
Note 1: Types with octal bases have *Miniature Metal Cap*; all others have *Small Metal Cap*.
Note 2: Subscript 1 on class of amplifier service (as AB_1) indicates that grid current does not flow during any part of input cycle.
Subscript 2 on class of amplifier service (as AB_2) indicates that grid current flows during some part of the input cycle.

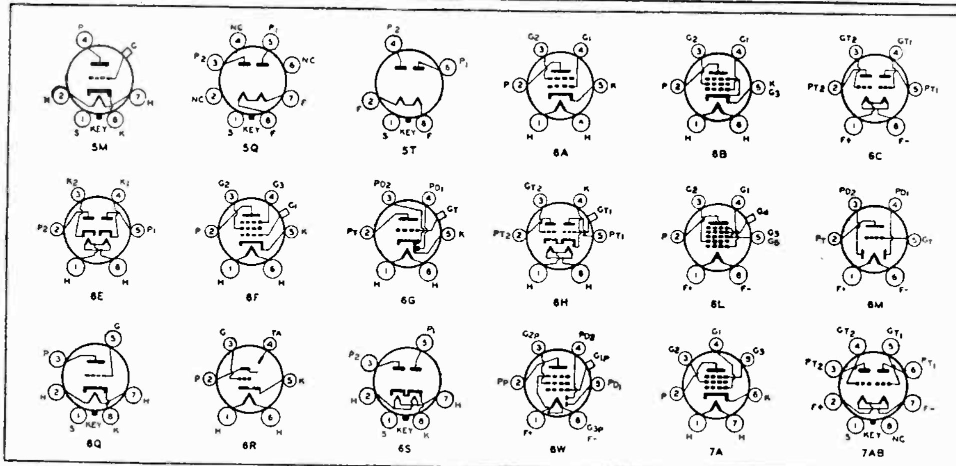
*Maximum.
‖ Megohms.

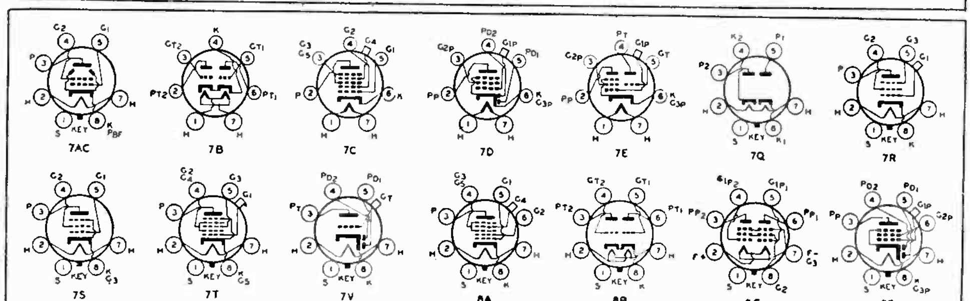
INDEX OF TYPES BY USE AND BY CATHODE VOLTAGE

Tubes of All-Metal construction are shown in BOLD FACE

CATHODE VOLTS	RECTIFIERS	VOLTAGE AMPLIFIERS Including Duplex-Diode Types	POWER AMPLIFIERS	CONVERTERS IN SUPERHETERODYNES	DETECTORS	MIXER TUBES IN SUPERHETERODYNES	INDICATORS (Visual)	CATHODE VOLTS
1.1	—	11, 12	—	—	11, 12	—	—	1.1
1.5	—	26	—	—	—	—	—	1.5
2.0	—	1A4, 1A6, 1B4, 1B5/25S, 1F6, 15, 30, 32, 34	1F4, 19, 31, 33, 49	1A6, 1C6	1A6, 1B5/25S, 1F6, 30, 32	1A6, 1C6, 34	—	2.0
2.5	82	2A6, 2B7, 24-A, 27, 35, 55, 56, 57, 58	2A3, 2A5, 45, 46, 47, 53, 59	2A7	2A6, 2B7, 24-A, 27, 55, 56, 57	2A7, 35, 58	—	2.5
3.3	—	22, 99	20	—	99	—	—	3.3
5.0	**5W4**, 5Z3, **5Z4**, 80, 83, 83-v	01-A, 40, 112-A	71-A, 112-A	—	00-A, 01-A, 40, 112-A	—	—	5.0
6.3	**6H6**, **6X5**, 1-v, 84/6Z4	6B7, **6B8**, **6C5**, 6C6, 6D6, **6F5**, 6F7, **6J7**, **6K7**, **6L7**, **6Q7**, **6R7**, 36, 37, 39/44, 75, 76, 77, 78, 85	6A4, 6A6, **6F6**, **6L6**, **6N7**, 38, 41, 42, 79, 89	6A7, **6A8**	6B7, **6B8**, 6C5, 6C6, 6F7, **6J7**, **6H6**, 6Q7, **6R7**, 36, 37, 75, 76, 77, 85	6A7, **6A8**, 6D6, **6K7**, **6L7**, 39/44, 78	6E5, 6G5	6.3
7.5	81	—	10, 50	—	—	—	—	7.5
12.6	12Z3	—	—	—	—	—	—	12.6
25.0	25Z5, **25Z6**	—	**25A6**, 43	—	—	—	—	25.0
30.0	—	—	48	—	—	—	—	30.0







KEY TO TERMINAL DESIGNATIONS OF SOCKETS (Bottom Views)

BP = Bayonet Pin
F = Filament
G = Grid
H = Heater
K = Cathode
NC = No Connection
P = Plate
P_{BF} = Beam Forming Plate
TA = Target

Alphabetical subscripts D, P, and T indicate, respectively, diode unit, pentode unit, and triode unit in multi-unit types.

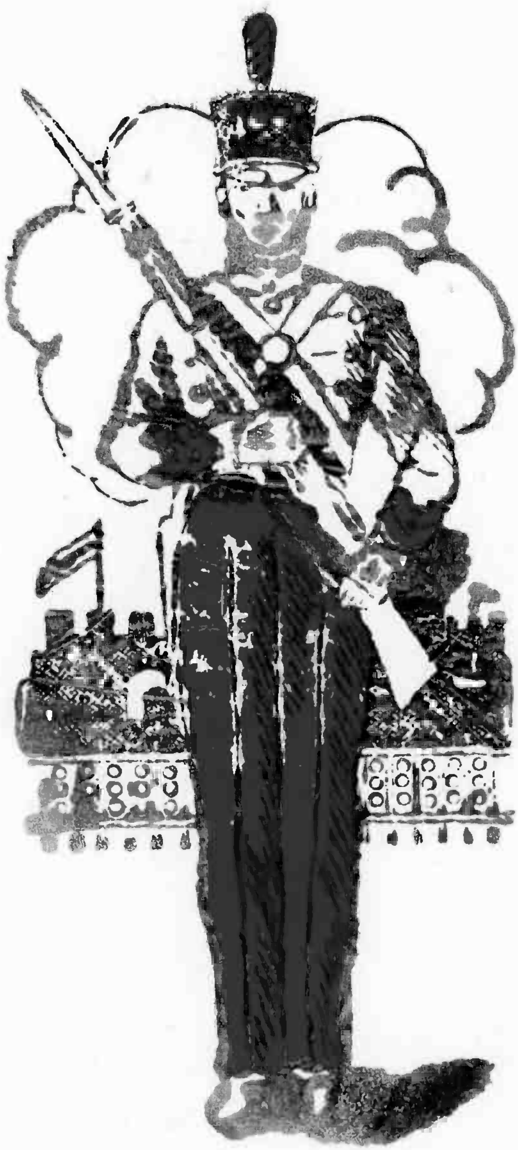
Numerical subscripts are used (1) in multi-grid types to indicate relative position of grids to cathode or filament, and (2) in multi-unit types to differentiate between two identical electrodes which would otherwise have the same designation.

RCA G-TYPE RADIO TUBES (Octal-Base, Glass-Bulb Types)

In addition to the types of tubes shown on pages 52 to 58, the following octal-base, glass-bulb types are also available. These types are identified by the letter "G" following the type number. For each of these types, the corresponding glass or metal types are indicated below, together with socket connections and overall dimensions. Characteristic data for the G-types are the same as those for the corresponding types on pages 52 to 58.

G-Series Type	Corresponding Glass Type	Corresponding Metal Type	Socket Connections	Max. Overall Dimensions Length x Diam.
1E7-G	‡	....	8C**	4 1/8" x 1 9/16"
1J6-G	19†	....	7AB**	4 1/8" x 1 9/16"
5V4-G	83-v	....	5L**	4 5/8" x 1 13/16"
5X4-G	5Z3	....	5Q**	5 1/16" x 2 1/16"
5Y3-G	80	....	5T**	4 5/8" x 1 13/16"
6A8-G	....	6A8	8A*	4 11/32" x 1 9/16"
6C5-G	....	6C5	6Q*	4 1/8" x 1 9/16"
6F5-G	....	6F5	5M♯	4 11/32" x 1 9/16"
6F6-G	....	6F6	7S♯	4 5/8" x 1 13/16"
6H6-G	....	6H6	7Q¶	4 1/8" x 1 9/16"
6J7-G	....	6J7	7R♯	4 11/32" x 1 9/16"
6K6-G	41	....	7S**	4 1/8" x 1 9/16"
6K7-G	....	6K7	7R*	4 11/32" x 1 9/16"
6L6-G	....	6L6	7AC*	5 11/16" x 2 1/16"
6L7-G	....	6L7	7T*	4 11/32" x 1 9/16"
6N7-G	....	6N7	8B*	4 5/8" x 1 13/16"
6Q7-G	....	6Q7	7V*	4 11/32" x 1 9/16"
6R7-G	....	6R7	7V*	4 11/32" x 1 9/16"
6X5-G	....	6X5	6S*	4 1/8" x 1 9/16"
25A6-G	....	25A6	7S*	4 5/8" x 1 13/16"
25Z6-G	....	25Z6	7Q*	4 1/8" x 1 9/16"

** Except that Pin No. 1 has no connection.
* Except that Pin No. 1 has no connection.
¶ Except that Pin No. 1 is connected to shield between diode units.
† Except that filament current is 0.24 ampere.
‡ Two 1F4's in the same bulb.
♯ Except that Pin No. 1 is connected to shield external to plate.




TIGERS