

# SERVICING

# hi-fi

# AM-FM TUNERS

*Includes Two Sections . . .*

## SECTION I—HIGHLIGHTS ON FM

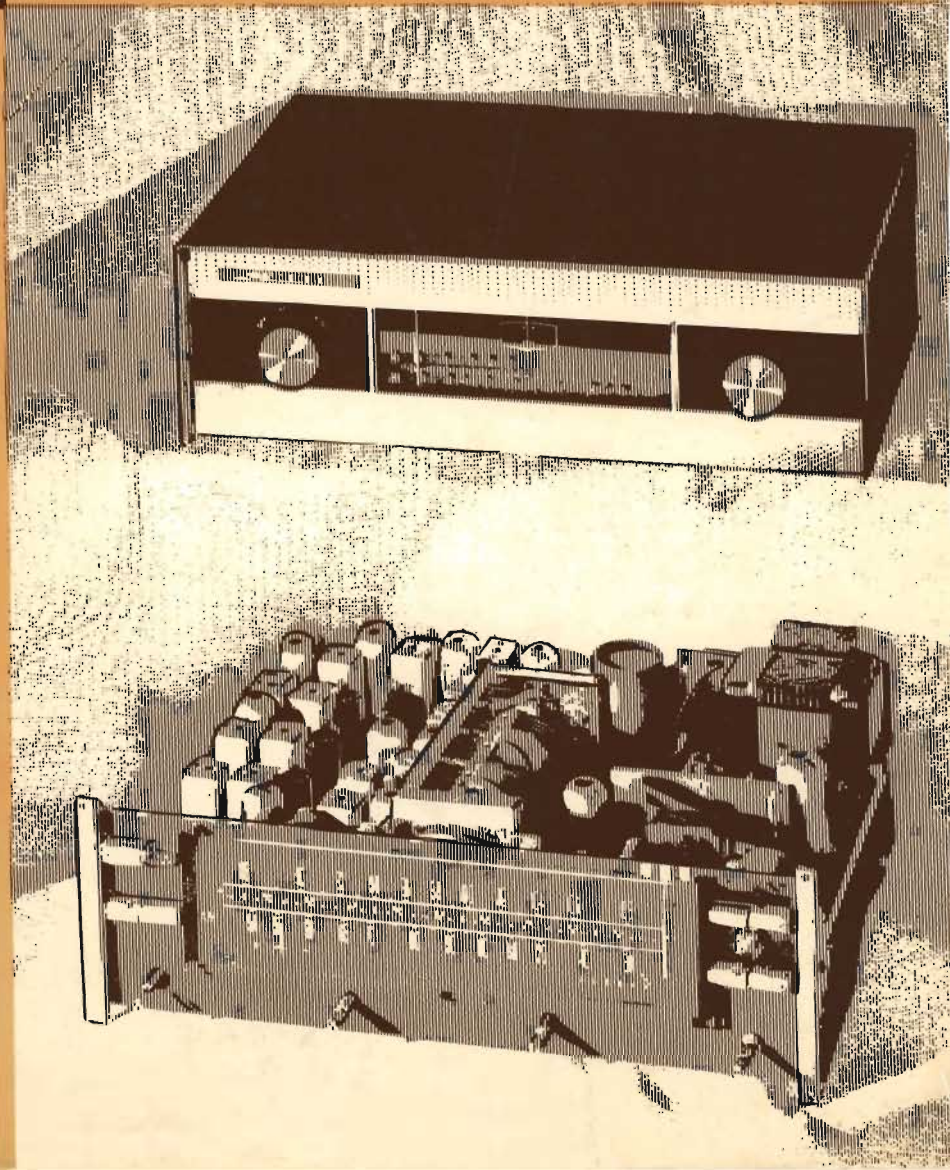
- The FM Signal
- AFC Circuits in FM Receivers
- Alignment Techniques Using a Sweep Generator

## SECTION II—COMPLETE PHOTOFAC SERVICE DATA on 18 models of 1957-58 AM-FM Tuners

- PHOTOFAC Schematics
- Dial Cord Stringing Arrangements
- Resistance Charts
- Cabinet and Chassis Photographs
- Alignment Instructions
- Parts Lists and Replacement Data

A *Haward W. Sams*

PHOTOFAC PUBLICATION—HF-3



# SERVICING HI-FI AM-FM TUNERS

VOLUME 3

(HF-3)



HOWARD W. SAMS & CO., INC.

Indianapolis 6, Indiana

FIRST EDITION  
FIRST PRINTING—JANUARY, 1959

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Library of Congress Catalog Card Number: 58-12699

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• Signifies Coverage in This Volume

# HIGHLIGHTS ON FM

The equipment used in high-quality home music systems usually includes an AM-FM tuner. A thorough understanding of the basic properties of the FM signal is essential to the technician when servicing the FM portion of a tuner.

These basic properties, along with a discussion of AFC circuits and alignment techniques, will be discussed in the following paragraphs.

## THE FM SIGNAL

The simplified waveform drawings in Fig. 1 point out the fundamental difference between amplitude and frequency modulation. In AM, the amplitude of an RF carrier wave is varied continually at an audio-frequency rate, but the carrier frequency itself remains constant. On the other hand, FM is a continual variation of carrier frequency without any change in amplitude. In both AM and FM, the fluctuations produced in the carrier will range from slight to extreme as the relative amplitude (volume) of the modulating audio signal varies from weak to strong.

In Fig. 1, the waveforms produced by amplitude modulation of a carrier are compared with those produced by frequency modulation of the same carrier. A relatively low level of modulation is illustrated by the first set of waveforms (A, B, and C). Fig. 1A represents the audio signal used to modulate the carrier, and Figs. 1B and 1C are the resulting amplitude- and frequency-modulated signals, respectively. The alternate "bunching" and "stretching" of RF cycles in Fig. 1C indicate periodic increases and decreases in frequency.

If the frequency of the modulating audio signal is doubled but its amplitude is unchanged, the apparent waveshape of the AM and FM signals does not change, except that twice as many cycles of modulation appear during a given period of time. (This is illustrated in waveforms D, E, and F.) However, if the modulating signal is kept at its original frequency but its amplitude is doubled, a definite change can be noted in the waveshapes. The effect of an increase in audio signal strength (Fig. 1G) is shown in Fig. 1H for AM and in

Fig. 1J for FM. Since a higher level of modulation is attained, higher peaks and deeper valleys are produced in the AM signal, while more severe "bunching" and "stretching" of alternate groups of RF cycles become apparent in the FM signal. In other words, both signals undergo greater swings away from the unmodulated condition.

There is a limit to the relative audio amplitude which can be permitted in each system, and the maximum level is termed "100% modulation". This point is reached in AM when the carrier level is reduced to zero at the negative peak of each audio cycle. Any further increase in modulation level results in carrier cutoff and in distortion of the modulation signal.

In an FM system, an increase beyond 100% modulation will not result in distortion, but will cause the bandwidth of the FM channel to be exceeded. The permissible limit is arbitrarily selected, and varies from one FM system to another. A frequency swing of  $\pm 75$  kc from the unmodulated or "center" frequency is considered 100% modulation in FM radio, but the corresponding figure for TV sound is only  $\pm 25$  kc.

The fact that FM radio and TV sound both have the same upper audio frequency limit of 15,000 cps demonstrates that the bandwidth of an FM system does not directly determine the highest audio frequency which can be transmitted. The ratio between the maximum carrier-frequency swing and the highest reproducible audio frequency is important, however. This "deviation ratio" or "modulation index" for FM radio is:

$$\frac{75,000}{15,000} = 5,$$

but, for TV sound it is only:

$$\frac{25,000}{15,000} = 1.67.$$

A high modulation index has the advantage of increasing the interference-rejecting ability of the FM system. This statement can best be explained by

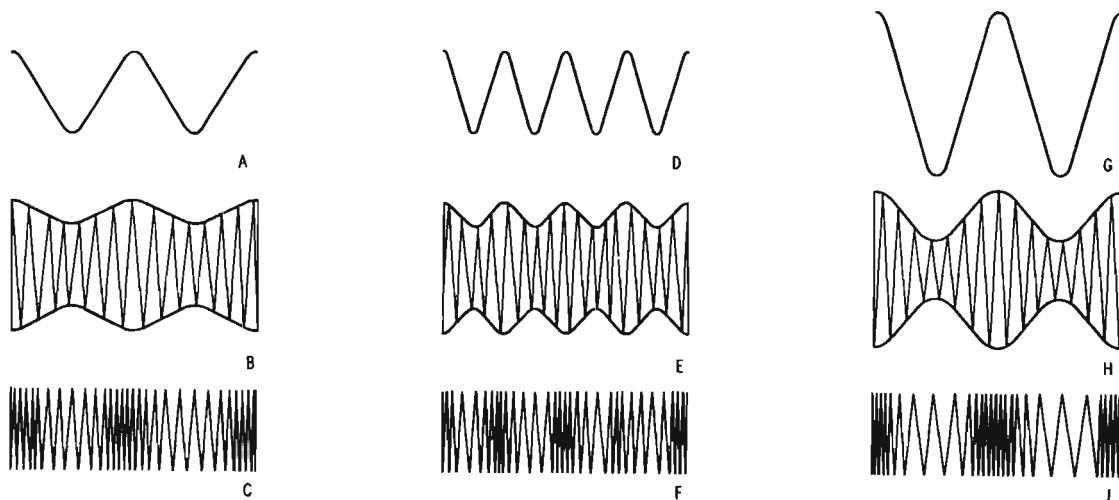


Fig. 1. Comparison of amplitude and frequency modulation of a carrier.

pointing out that certain kinds of interfering signals will react with the desired FM signal to produce unwanted frequency modulation. These spurious signals are demodulated by the FM detector and, thus, reach the ear as noise. Fortunately, even the worst of these interfering signals cause relatively small swings in carrier frequency — seldom as much as 15 kc, and usually much less. Remember that the amount of frequency swing determines the loudness of the reproduced sound. In a system with a high modulation index, normal program material produces frequency swings as great as  $\pm 75$  kc, sufficient to drown out most of the FM-type interference.

The lower deviation ratio of the TV sound signal makes it less immune to such interference than the FM radio signal, but this presents no practical problem because higher transmitter power is normally used in TV than in FM radio.

We have not yet considered the most annoying of all types of interference — amplitude modulation of a carrier by atmospheric static, auto ignition, and other noise sources. Perhaps the most valuable feature of FM is its ability to eliminate this noise interference almost completely. Since amplitude variations of the carrier provide no useful information in FM, they can be stripped off and discarded by passing the signal through some kind of limiter stage in the receiver. Some types of FM detectors, such as the ratio detector, accomplish limiting as a by-product of demodulation. In most commercial FM receivers, noise elimination is highly effective except when the input signal is extremely weak.

This noise-rejecting ability of FM allows a station to deliver a clean signal to practically all of its service area. Thus, an FM station in the VHF band, although theoretically restricted to line-of-sight transmissions, can dependably serve an area as large as that covered by a low- or medium-powered AM station on the long-wave broadcast band. Even though the AM signal may travel farther, reception in fringe areas is often marred by interference from other stations in the crowded broadcast band, as well as by fading and static.

Just how far will the FM signal reach? Transmitter power, antenna height, terrain, and receiver sensitivity will enter into any exact computation of range, but a moderately low-powered FM radio station (about 5 kw) should generally be able to maintain a signal strength as high as 50 microvolts in all but a few "problem" locations at distances up to 30-50 miles from the transmitter. This signal intensity is adequate for most receivers, and deluxe hi-fi FM tuners can produce a clear output from much weaker signals. With a sensitive tuner and a high-gain antenna, consistent reception at distances of well over 100 miles has often been reported.

The sensitivity of a high-quality tuner is often expressed as a certain number of microvolts "for 20 (or 30) db quieting". An RF input of this specified value (usually less than  $5\mu\text{v}$ ) is the weakest signal which can hold internal receiver noise down to an unobjectionable level during pauses in modulation. The phrase "20 db quieting" means that the tuner output level measured during reception of an unmodulated carrier is 20 db lower than the output measured during 400-cps, 30% modulation of the same carrier. At RF signal levels lower than the specified minimum, the carrier becomes too weak to satisfactorily suppress internal receiver noise.

FM's wide audio-frequency range of 30-15,000 cps is certainly an important reason for the hi-fi quality of FM sound, but it should be emphasized that wide-band response is neither an exclusive feature of FM nor the sole requirement for high fidelity. Standard AM broadcasting could provide a frequency range equal to that of FM if a wider channel were allocated for each station, but such a move is impractical for two good reasons.

1. The long-wave AM broadcast band is already overcrowded, and the only way to widen channels would be to force numerous stations off the air.
2. AM already has the drawback of being highly susceptible to interference, and an increase in bandwidth would tend to aggravate this problem.

"Moving upstairs" to VHF and changing to FM transmission proved to be the best way to satisfy both major requirements for hi-fi broadcasting — wide frequency range and freedom from noise.

### AFC CIRCUITS IN FM RECEIVERS

Automatic frequency control (AFC) is applied to the local oscillators of many FM receivers. Although not absolutely essential to the operation of a receiver, AFC is a desirable feature which simplifies tuning.

Two troublesome problems during FM reception are minimized by the use of an AFC circuit. One of these is oscillator drift. A station may be properly tuned in when the receiver is first switched on, but the heating of components during continued operation may cause the oscillator frequency to change enough that the sound from the receiver becomes distorted. If the receiver is equipped with AFC, the oscillator is automatically kept tuned to the proper frequency. As a result, the listener does not have to readjust the tuning control after the receiver has warmed up to normal operating temperature.

The other problem is distortion arising from inaccurate tuning. The sound obtained from an FM receiver is at its best when the local oscillator is tuned so that the center frequency of the IF signal equals the resonant frequency of the detector transformer. (The center frequency is the same as the frequency of the unmodulated IF signal.) Modulation of the IF signal causes its frequency to vary above and below center by as much as 75 kilocycles. The FM detector converts these frequency variations into voltage variations. The detector has a relatively broad bandpass and will develop an output voltage even when the instantaneous frequency of the IF signal is nearly 200 kilocycles above or below the frequency to which the detector is tuned. If the local oscillator is tuned inaccurately, an incoming signal will be converted into an IF signal which will occupy an incorrect range of frequencies, but which can still be detected. Sound will then be produced, but will usually be more or less distorted.

A receiver that does not feature AFC must be tuned somewhat critically for best results. On the other hand, a receiver that has an AFC circuit will automatically adjust itself for the clearest possible reception of a station, whether the station is tuned in carefully or not. Most of the expensive FM tuners designed to be included in high-fidelity systems are



equipped with AFC so that an output free from distortion can be easily obtained.

#### Functional Description of Circuit

The AFC circuit is essentially a feedback system. It is somewhat like an AGC system in this respect, although the two types of circuits have different purposes. Fig. 2 is a block diagram of the stages included in the AFC feedback path. The general

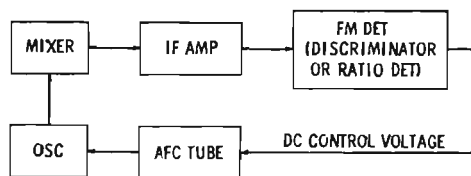


Fig. 2. Block diagram of the feedback path for AFC.

operation of the AFC system is as follows: If the local oscillator is incorrectly tuned, the center frequency of the IF signal will not be equal to the resonant frequency of the detector transformer. An unbalanced condition will then be set up in the detector, and a DC control voltage proportional to the error in the intermediate frequency will be produced. The correction voltage is positive if the oscillator frequency is high, and negative if the frequency is low.

The control voltage is placed on the grid of the AFC tube. This tube functions as though it were a capacitor connected across the tuned tank circuit of the local oscillator, and the tube can therefore be used for controlling the oscillator frequency. (See Fig. 3.) The amount of capacitance added to the tank circuit by the AFC tube is determined by the amount of conduction through the tube, and this amount in turn depends upon the DC level of the control voltage on the grid. Placement of reactance in a circuit is the main function of an AFC tube; therefore, it is commonly called a reactance tube. A circuit of this same general type can be designed with inductive reactance, but this discussion will deal only with the capacitive circuit because this is the one used in many FM receivers.

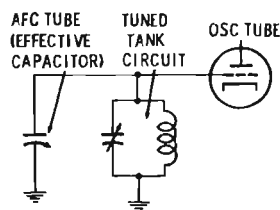


Fig. 3. Equivalent circuit of an AFC tube and a tuned tank circuit.

The theory behind the operation of a typical reactance tube will be explained with the aid of the simplified schematic in Fig. 4. The circuit in this figure may be broken down into three parts. One of these is the tuned tank, composed of C4 and L1; the second is the cathode-to-plate circuit of the reactance tube; and the third is a feedback network which includes C1, R1, and the coupling capacitor C3.

The RF voltage generated in the oscillator tank is impressed across the feedback network. The reactance of capacitors C3 and C1 is much greater than the resistance of R1; consequently, the phase of the current passing through the feedback network will lead the phase of the applied voltage. When the feedback

current passes through R1, a voltage in phase with this current is developed across the resistor. The voltage across R1 is applied to the grid of the reactance tube.

The AC plate current of the tube will be in phase with the grid voltage because the plate current increases when the grid voltage goes in a positive direction. The AC plate voltage of the tube is identical with the voltage fed back from the oscillator through C3. If the plate current is compared with the plate voltage, it will be seen that the former is leading the

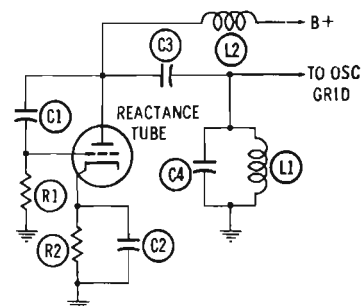


Fig. 4. Basic circuit of a reactance tube.

latter. This behavior is characteristic of a capacitive circuit.

The tube circuit in Fig. 4 has a constant value of capacitance because steady conduction is maintained through the tube. In a circuit where the DC grid voltage of the tube can be varied, the conduction can be increased or decreased, and the capacitance of the circuit can be changed. A swing of grid voltage in a positive direction allows a relatively large capacitive current to pass through the tube. This capacitive current is added to the one in the tank circuit. The increase in capacitive current has the same effect as a decrease in the capacitive reactance of the tank circuit, and the oscillator frequency is lowered. On the other hand, a negative swing of grid voltage causes a decrease of capacitive current through the reactance tube. The capacitive reactance of the parallel combination of the tank circuit and the reactance tube then appears to be increased, and the oscillator frequency rises.

#### Details of AFC Circuits

The AFC circuit of an FM tuner is shown schematically in Fig. 5. This circuit has many features typical of present-day designs. The AFC tube is one-half of a 12AT7 dual triode, and the other half of the same tube serves as the local oscillator. In recent years, the 12AT7 has been by far the most popular tube for use in AFC circuits. Other tubes sometimes used are a separate 6AB4 triode or the pentode section of a 6U8.

The control voltage is derived from the output voltage of a ratio detector. This output contains audio-frequency variations, but these are centered upon some DC reference level. When the output signal is put through a low-pass filter, a DC voltage corresponding to the reference level is obtained. The level of this DC voltage is zero when the frequency of the input signal of the ratio detector is correct. The voltage becomes positive when the frequency of the input signal increases, and it becomes negative when the input frequency decreases. The control voltage is produced as long as an output signal is developed by



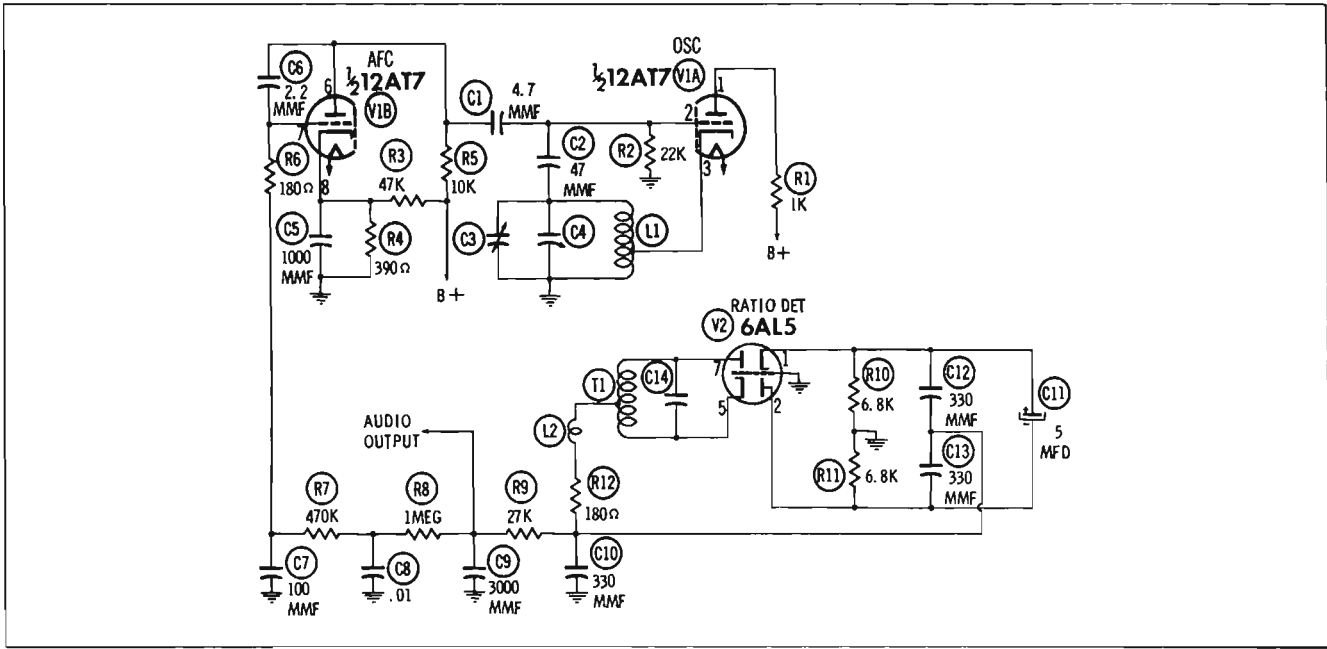


Fig. 5. AFC and oscillator circuits of the Packard-Bell Model 10RP1 tuner.

the ratio detector; therefore, the AFC system may be expected to control the oscillator frequency whenever sound from a station can be heard from the speaker.

The control voltage drops off abruptly at the limits of the bandpass of the ratio detector, but the audio output drops off at the same time. Stations therefore seem to "snap" in and out of tune instead of fading in and out gradually when an FM receiver equipped with AFC is tuned through its range.

The design of the AFC filter will vary only slightly among the different makes of FM receivers. The input resistor (R8 in Fig. 5) is very large in value. The combination of R8 and C8 has a long time-constant, and these two components filter most of the audio signal from the AFC control voltage.

The resistor nearest the grid of the AFC tube serves as part of the feedback network of the AFC tube. This resistor is R6 in Fig. 5, and corresponds to R1 in Fig. 4. The connection of R6 to ground is made through the 100-mmf capacitor C7. If a direct connection were made, it would be difficult to apply an adequate DC control voltage to the grid. Fortu-

nately, a direct ground is unnecessary. C7 has little reactance at the very high frequency of the FM local oscillator, and the feedback signal readily follows the path through C7 to ground. The phase of the grid voltage is barely shifted by C7.

A capacitor must have extremely low capacitance if it is to present much reactance to a signal at the oscillator frequency. Capacitor C6 in Fig. 5 has the same function as feedback capacitor C1 in Fig. 4, but C6 has a value of only 2.2 mmf. Coupling capacitor C1 in Fig. 5 corresponds to C3 in Fig. 4, but C1, like C6, has very low capacitance (4.7 mmf).

Remember that the resistance of R6 must be equal to a very small fraction of the reactance of C6 in order that the proper phase shift will occur in the grid circuit of the tube. The ohmic value of R6 is consequently made very low. The grid resistors of AFC tubes in FM receivers will consistently have values of a few hundred ohms at the most.

In the circuit of Fig. 5, the cathode of the reactance tube is connected to the B+ line through the 47,000-ohm resistor R3. This resistor and the 390-

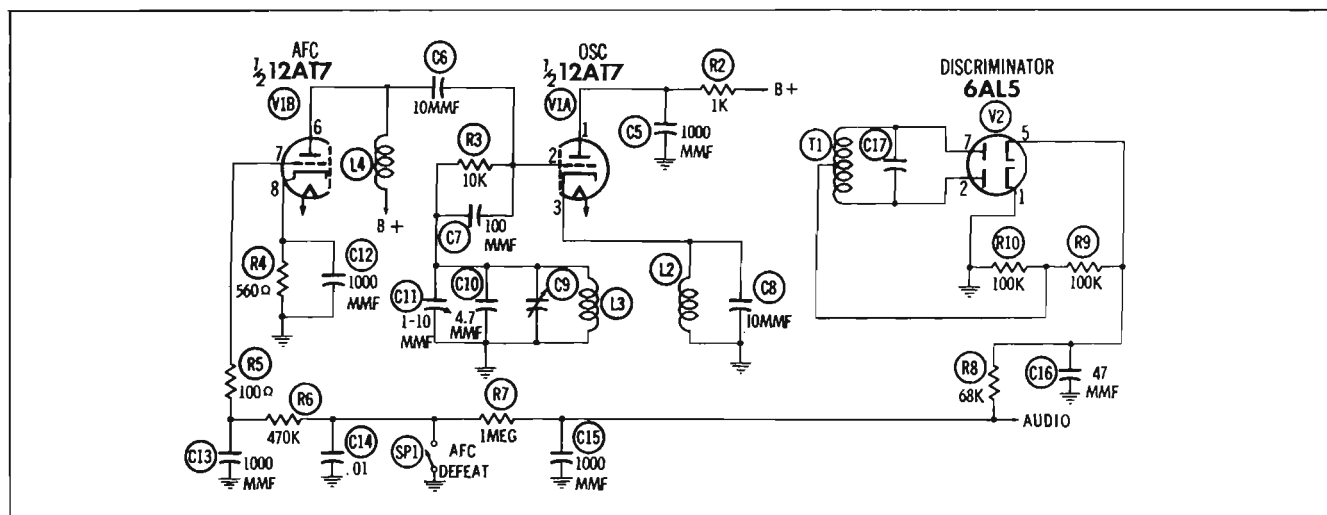


Fig. 6. AFC and oscillator circuits of the Harmon-Kardon Model D200 tuner.

ohm resistor R4 form a voltage divider from B+ to ground. The cathode voltage has a value of approximately one volt. One function of the voltage divider is to keep the cathode voltage at a reasonably constant level. If there were no divider, the value of the cathode voltage would depend solely upon the amount of tube current passing through R4. A change in tube conduction would cause a rise or fall in cathode voltage. For example, a positive swing of DC voltage on the grid would cause an increase in the conduction of the tube. The cathode voltage would then become more positive, and some of the effect of the change in grid voltage would be canceled. When R4 is used as part of a voltage divider, additional current passes through the resistor and plays a part in determining the cathode voltage. This extra current does not fluctuate according to the state of conduction of the tube, and the net result is that the cathode voltage remains relatively steady. The grid voltage then has the greatest possible effect upon the bias of the tube.

Another AFC circuit is shown in the schematic in Fig. 6. The control voltage for this second circuit is the filtered output voltage of a discriminator. This output is the same as that obtained from a ratio detector. The filtered voltage is zero when the oscillator frequency is correct, and the voltage will vary in either a positive or a negative direction if there is an error in oscillator frequency.

This circuit contains no actual capacitor which corresponds to C1 in Fig. 4; instead, the grid-to-plate capacitance of the AFC tube fulfills the function of the feedback capacitor. The feedback network also includes C6, R5, and C13.

The AFC circuit of Fig. 6 operates whenever the main selector switch of the receiver is in the FM position. A special AFC defeat switch is provided so that the listener can conveniently disable the AFC circuit momentarily. When the tuning knob is pushed inward, the switch is closed and the control voltage is shorted to ground. This switch is especially helpful when the listener is trying to tune in a weak station very close in frequency to a strong station. Under these conditions, the AFC system sometimes ignores the weak station and attempts to adjust the oscillator frequency for reception of the strong station. If this happens, the defeat switch should be closed until the weak station has been tuned in precisely. The AFC circuit should then give satisfactory results when put back into operation.

The main selector switches of some receivers have two positions in which FM programs can be received. The AFC circuit operates normally when the switch is in one position, but the control voltage is removed from the grid of the AFC tube when the switch is turned to the other position.

#### Defects in AFC Circuits

Troubles that might seem to be in the AFC circuit are frequently secondary effects of troubles in related circuits, such as the oscillator or the detector. The most serious kind of defect that can originate in the AFC circuit itself is an intermittent condition which gives rise to erratic conduction of the AFC tube. Uneven conduction will cause random changes in the capacitance of the AFC circuit. The frequency of the oscillator will then shift erratically, and distortion in the sound will be noticed from time to time.

Many AFC defects will cause the receiver to behave as if it had no AFC circuit. Clear sound can still

be obtained if the receiver is tuned carefully, but the oscillator may drift. Defects such as low transconductance in the AFC tube will tend to change the capacitance of the AFC circuit, but the listener will not be conscious of any trouble in this case. He will probably tune the oscillator to a slightly different frequency and compensate in this way for the defect.

### ALIGNMENT TECHNIQUES USING A SWEEP GENERATOR

A good technician's ability to repair electronic devices rapidly is limited by his knowledge of the applications of his test equipment. The sweep generator is the accepted unit for video IF alignment and trouble-

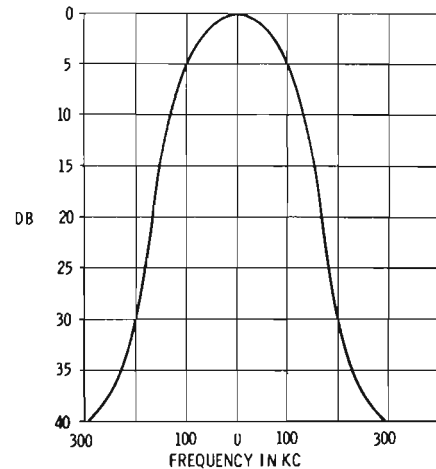
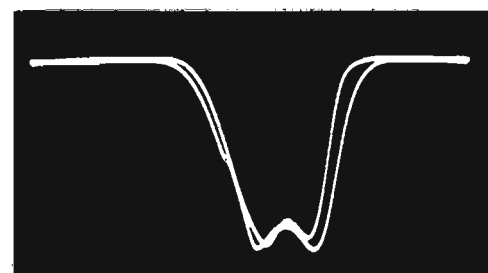


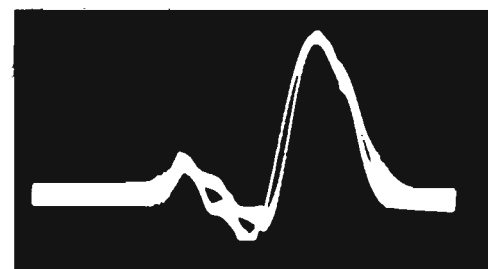
Fig. 7. Ideal response curve at the input of the FM detector.

shooting, but most technicians have not seen fit to employ it in FM work. The bandpass requirements of a good FM tuner, while not as complex as those for video, are nonetheless critical.

In a typical hi-fi FM tuner, the desired bandwidth at the detector input is shown in Fig. 7. Note



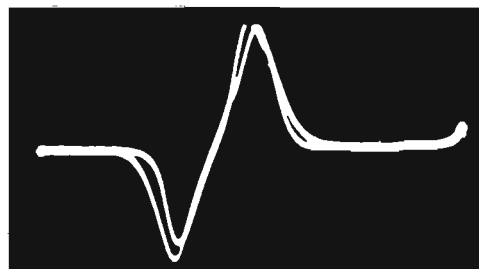
(A) Swept.



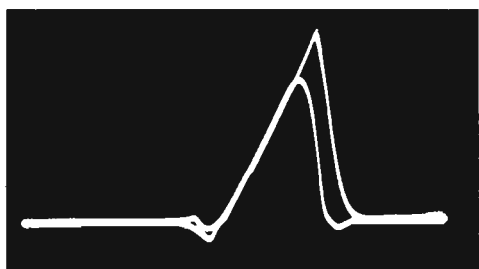
(B) Non-swept.

Fig. 8. Response curves obtained with swept and non-swept alignment techniques.

that the response is down only 5 db at points 100 kc on either side of center frequency and is 40 db down at 300-kc deviation points. Correct alignment would, therefore, be extremely difficult to obtain with an AM signal generator and VTVM. To prove this point, the response curve obtained after alignment with an AM generator and VTVM is compared with the results of a sweep generator and oscilloscope alignment in Fig. 8. Discriminator curves obtained by these same methods are compared in Fig. 9.



(A) Swept.



(B) Non-swept.

Fig. 9. Discriminator patterns obtained with swept and non-swept techniques.

Should the alignment instructions specify the AM generator-VTVM method and you wish to further improve operation of the receiver, the swept alignment method used here can be utilized. First of all, the sweep signal must be injected at the proper point. A separate mixer is employed in the receiver under test, and as shown in Fig. 10, a 3.3-megohm resistor acts as the DC load for the mixer grid. The simplest way of introducing a signal into this type of circuit is to clip the hot lead of the signal generator to the upper end of the resistor body (Fig. 11), connecting the ground lead of the generator to the ground lead of the same resistor. The scope is then connected across the grid-leak network (Fig. 12) of the last limiter stage if one is employed. If no limiter stage is used, the scope should be connected across the 100K-ohm resistor between the center tap of the detector transformer and ground. The IF transformers can now be adjusted to produce the desired 200-kc response between 5-db points.

For adjustment of the detector transformer, the scope is connected to the output (Fig. 12) and the trans-

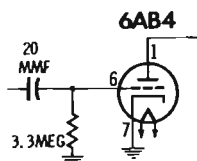


Fig. 10. Grid circuit of separate FM mixer stage used in some receiver designs.

former slugs are adjusted for proper "S" pattern reproduction (see Fig. 13). If a ratio detector is employed instead of a discriminator, it will be necessary, during the IF bandpass alignment, to disconnect the electrolytic capacitor used across the output, and then reconnect it when adjusting for the "S" pattern. Signal for the IF response curve is obtained across the 47K-ohm detector load when this circuit is used. (See Fig. 14.) When the sweep method is used, it isn't necessary to use the two 100K-ohm resistors specified for

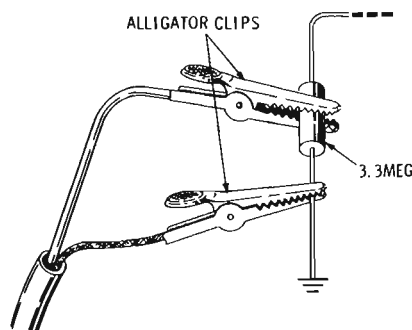


Fig. 11. Signal injection involves clipping hot lead to the top of resistor body.

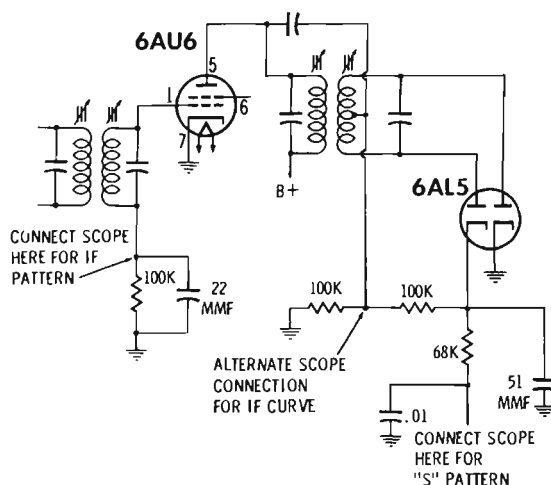


Fig. 12. Schematic showing scope connection points for IF and detector alignment.

zero balance with a VTVM. As was true with the discriminator, the ratio detector "S" pattern is obtained at the detector output.

Normally, alignment is performed with the least amount of signal that will produce a usable indication. When the alignment has been completed in this manner, the scope should be connected across the limiter grid-leak circuits and the generator gain advanced while the response curve is observed. The point where the curve no longer increases in amplitude is where full limiting occurs. While the shape of the curve will change during this procedure, it shouldn't become appreciably distorted. If it does, the signal input should be reduced until response is midway between the highest and lowest tolerable levels, and the IF and detector circuits should be readjusted for the proper curves. A point should be reached where both high- and low-level responses are acceptable.

Some signal generators do not have 10.7-mc internal markers, but do have markers in the 88- to 108-

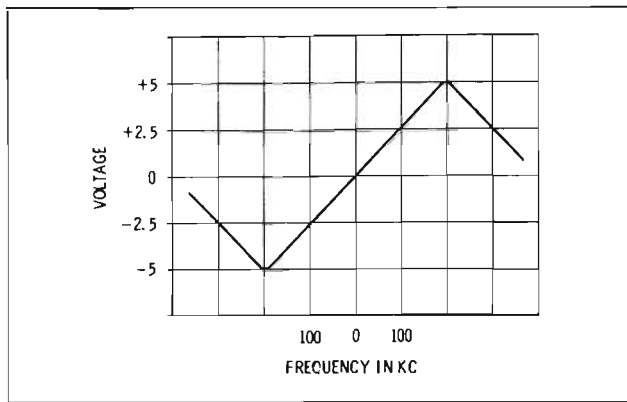


Fig. 13. Drawing of ideal "S" pattern at the detector output.

mc range. In this event, a sweep signal with a center frequency of about 98 mc and a width of 600 kc to 1 mc should be applied to the antenna terminals; 120-ohm carbon resistors are connected in series with the generator leads for impedance matching. With the

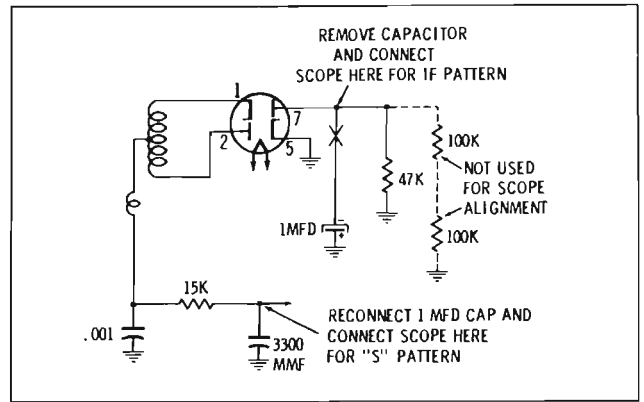
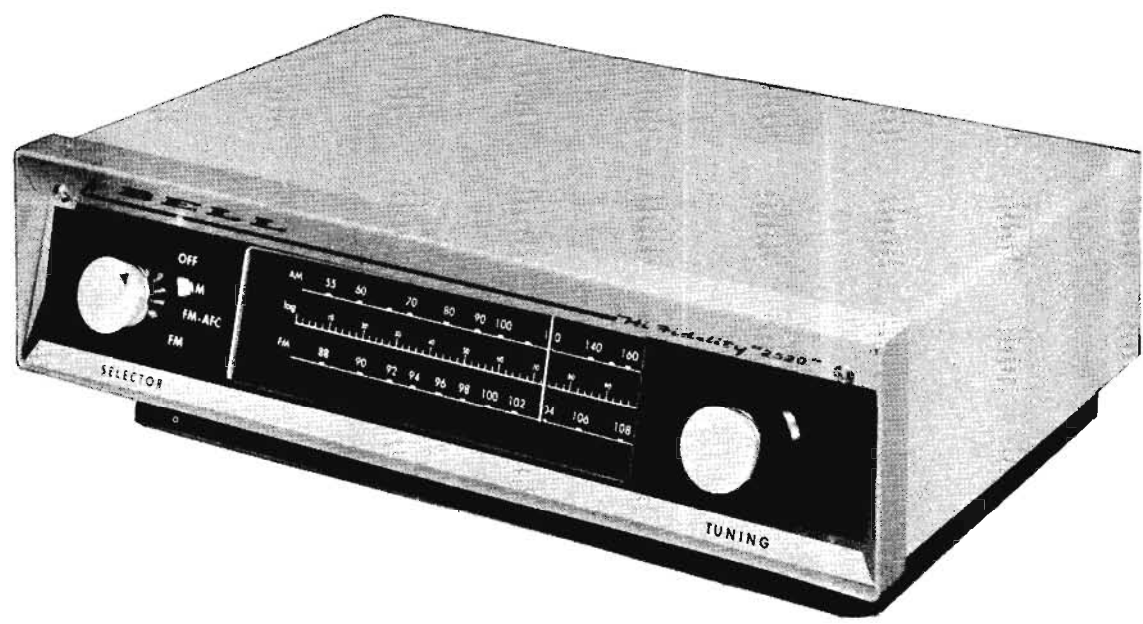


Fig. 14. Schematic of ratio detector stage, showing scope connection points.

marker generator and station selector both tuned to 98 mc and the scope connected as previously outlined, the sweep frequency is varied slightly until the proper pattern is present on the scope. The IF and detector circuits can then be aligned for proper response.





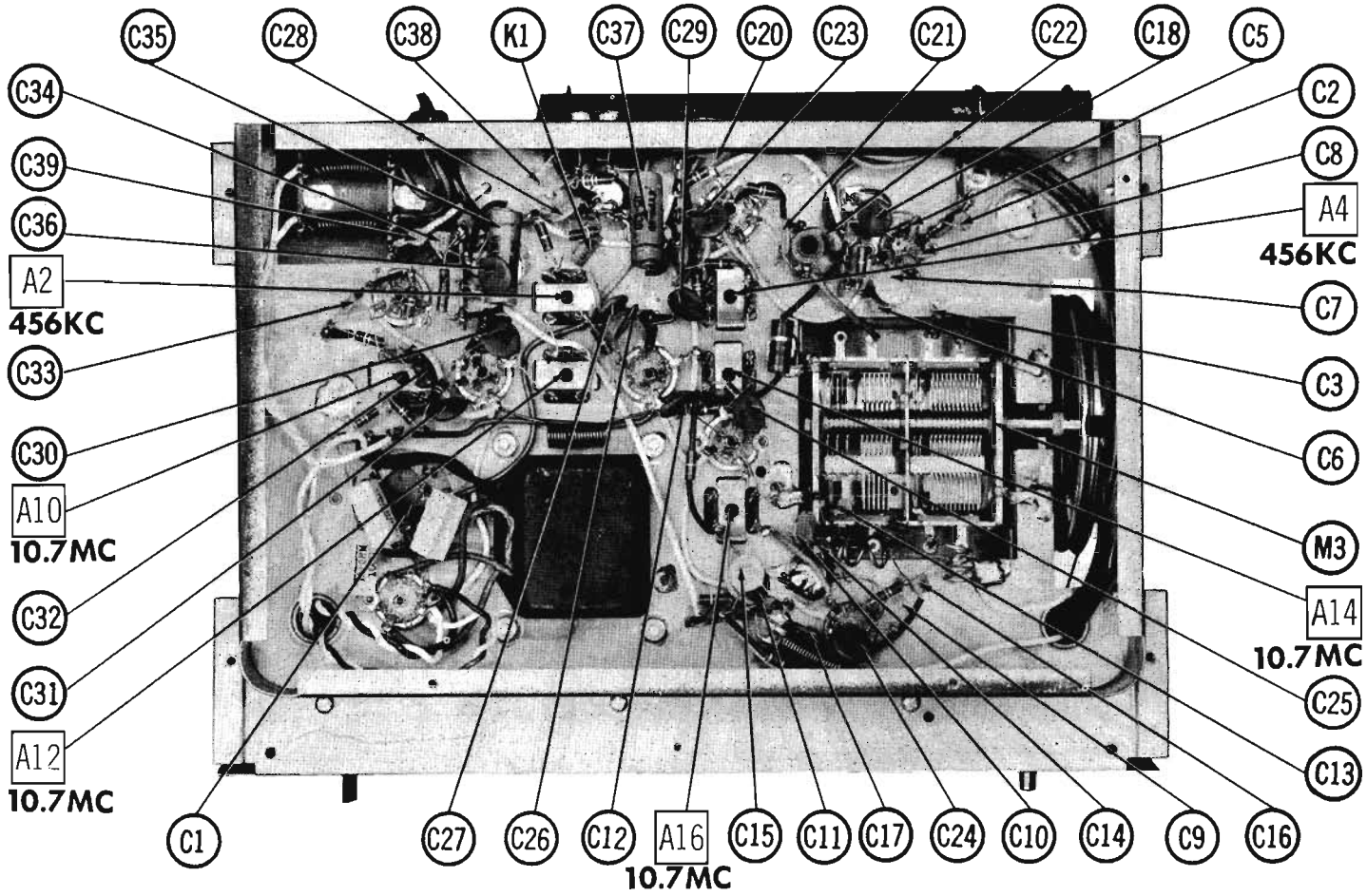
**BELL SOUND  
MODEL 2520**

TRADE NAME	Bell Sound MODEL 2520	
MANUFACTURER	Bell Sound Systems Inc., 555 Marlon Road, Columbus 7, Ohio	
TYPE SET	AC Operated FM-AM Tuner	
TUBES (Eight)	Types 6AB4 FM RF Amp., 12AT7 FM Conv.-FM AFC, 6BA6 1st. FM IF Amp., 6BE6 AM Converter, 6BA6 2nd. FM-1st. AM IF Amp., 6AU6 FM Limiter-AM Det.-AVC, 6AL5 Discriminator, 6X4 Rect.	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .41 Amp. @ 117 Volts AC (40 Watts)
TUNING RANGE	540-1650KC	FREQ. MOD. 88-108MC

**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

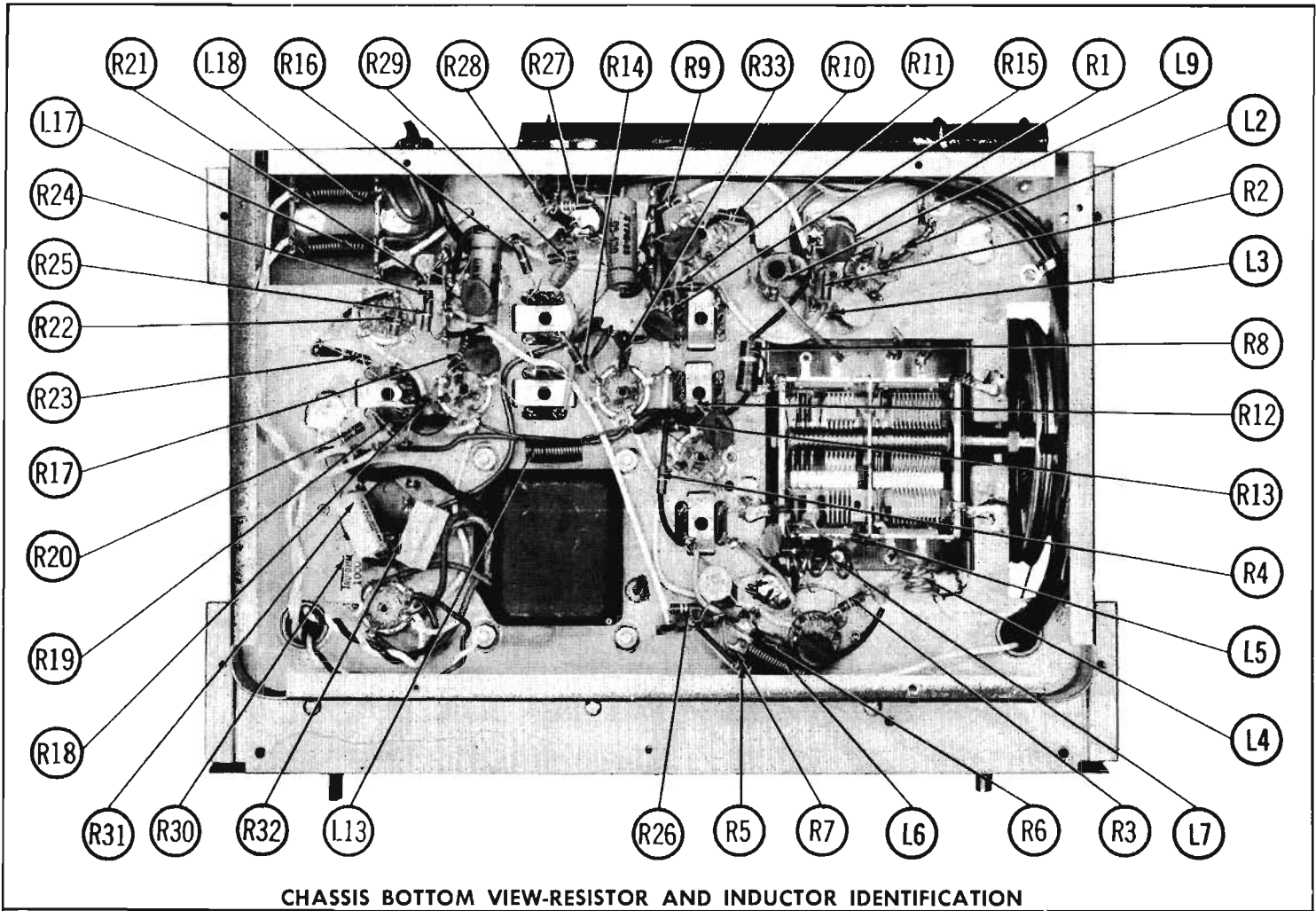
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H698

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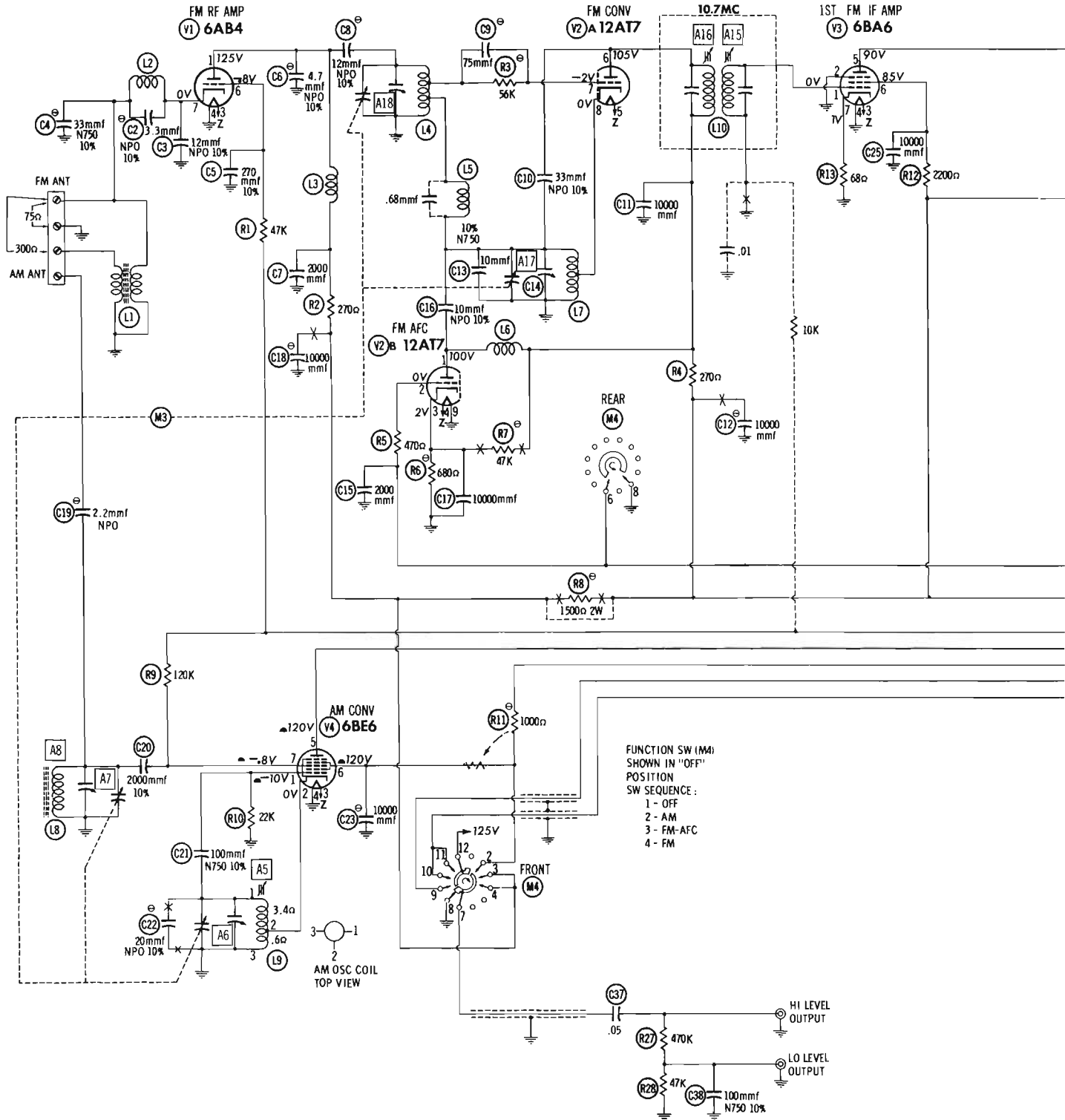


CHASSIS BOTTOM VIEW - CAPACITOR, MISC. & ALIGN. IDENT.





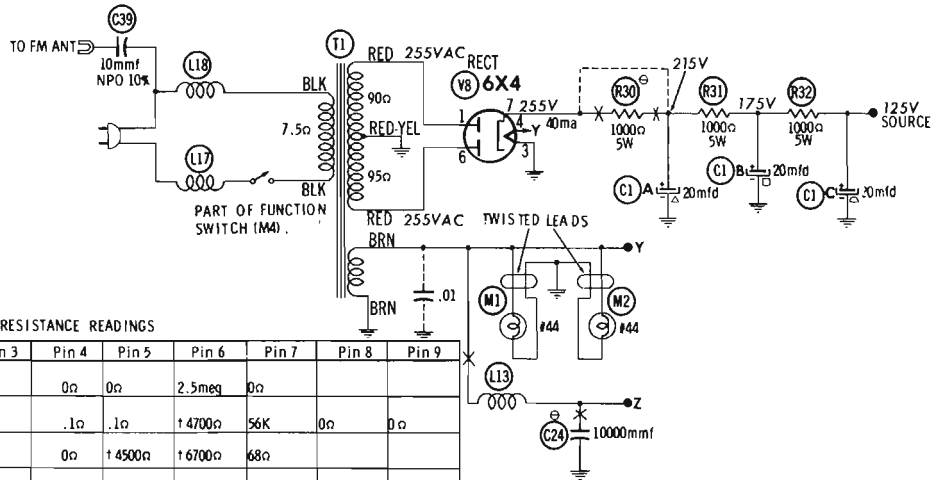
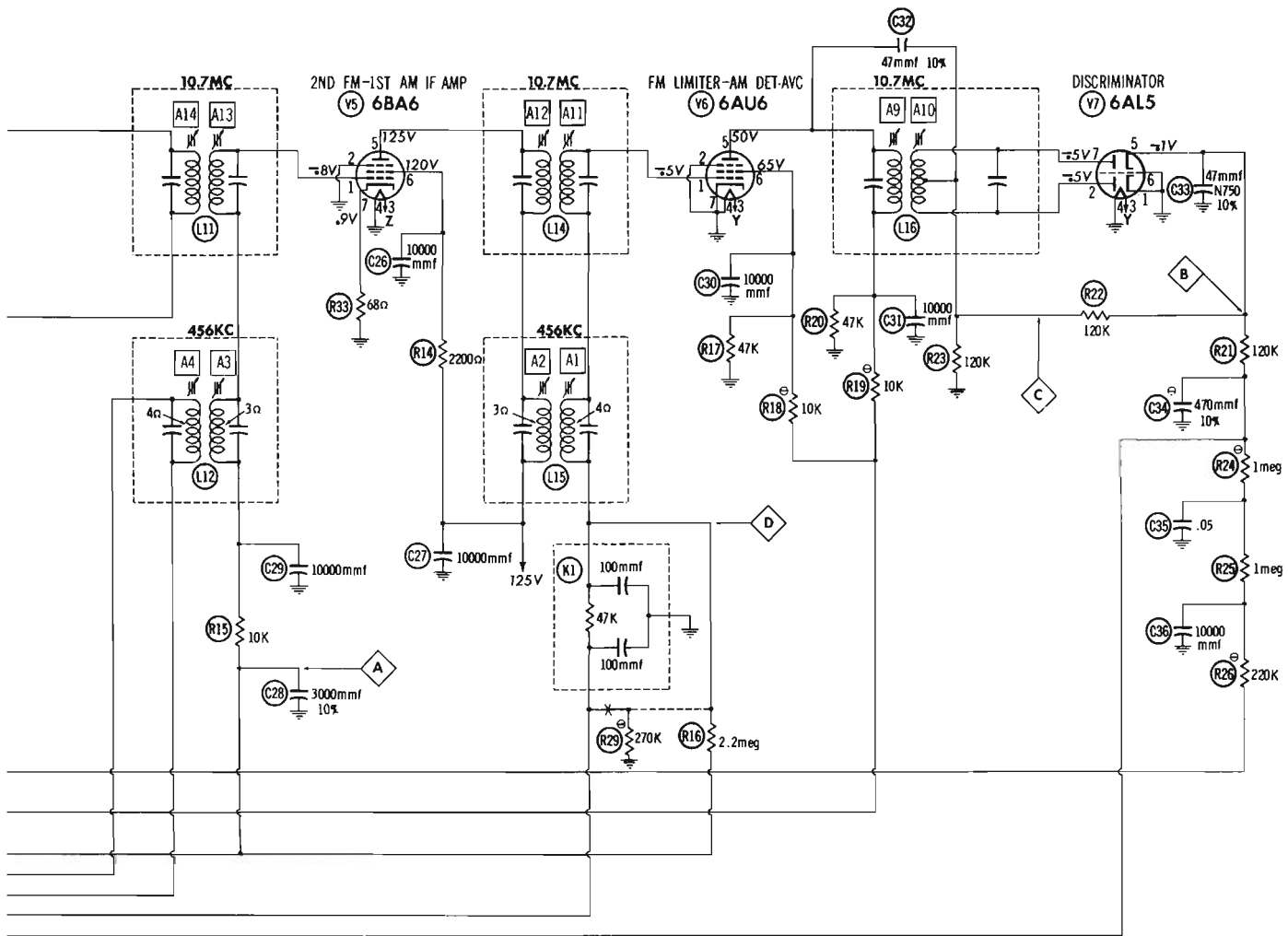
CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION  
 DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFAC STANDARD NOTATION SCHEMATIC  
 Howard W. Sams & Co., Inc. 1958



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AB4	†3300Ω	0Ω	.1Ω	0Ω	0Ω	2.5meg	0Ω		
V2	12A17	†4700Ω	470Ω	680Ω	.1Ω	.1Ω	†4700Ω	56K	0Ω	0Ω
V3	6BA6	.4Ω	0Ω	.1Ω	0Ω	†4500Ω	†6700Ω	68Ω		
V4	6BE6	.22K	.4Ω	.1Ω	0Ω	†1000Ω	†1000Ω	2.5meg		
V5	6BA6	2.5meg	0Ω	.1Ω	0Ω	†3000Ω	†5200Ω	68Ω		
V6	6AU6	290K	0Ω	.1Ω	0Ω	†12K	†12K	0Ω		
V7	6AL5	0Ω	120K	.1Ω	0Ω	200K	0Ω	120K		
V8	6X4	90Ω	NC	0Ω	.1Ω	NC	95Ω	†		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.

† THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

‡ MEASURED FROM PIN 7 OF V8.

- MEASURED IN "AM" POSITION.

NC NO CONNECTION.

# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01mfd	High side to pin 1 (grid) of 6BA6 (V5). Low side to chassis.	456KC (Unmod)	AM	Tuning gang fully open	DC probe to point $\textcircled{A}$ . Common to chassis.	A1, A2	Adjust for maximum deflection.
2. "	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	"	"	"	"	A3	Connect 50mmf from pin 5 (plate) of 6BE6 (V3) to chassis and adjust for maximum deflection.
3. "	"	"	"	"	"	A4	Connect 50mmf from pin 1 (grid) of 6BA6 (V5) to chassis and adjust for maximum deflection.
4. "	High side to AM antenna terminal. Low side to chassis.	600KC	"	600KC	"	A5	Adjust for maximum deflection.
5. "	"	1400KC	"	1400KC	"	A6	"
6. "	"	1000KC	"	Tune to 1000KC signal	"	A7	"
7. "	"	600KC	"	Tune to 600KC signal	"	A8	Adjust for maximum deflection. Repeat steps 4 thru 7.

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
8. .01mfd	High side to pin 1 (grid) of 6AU6 (V6). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe thru 100K to point $\textcircled{B}$ . Common to chassis.	A9	Adjust for maximum deflection.
9. "	"	"	"	"	DC probe thru 100K to point $\textcircled{B}$ . Common to point $\textcircled{C}$ .	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
10. "	High side to pin 7 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	DC probe thru 100K to point $\textcircled{D}$ . Common to chassis.	A11, A12, A13, A14, A15, A16	Adjust for maximum deflection.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
8. .01mfd	High side to pin 1 (grid) of 6AU6 (V6). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. thru 100K to point $\textcircled{B}$ . Low side to chassis.	A9	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
9. "	"	"	"	"	Vert. Amp. thru 100K to point $\textcircled{C}$ . Low side to chassis.	A10	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.
10. "	High side to pin 7 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	Vert. Amp. thru 100K to point $\textcircled{D}$ . Low side to chassis.	A11, A12, A13, A14, A15, A16	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.

### FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
11. Two 120 $\Omega$ Carbon Resistors	Across FM antenna terminals with 120 $\Omega$ on each side.	90MC (Unmod)	FM	90MC	DC probe to point $\textcircled{A}$ . Common to chassis.	L7, L4	Adjust for maximum deflection by compressing or expanding coil turns.
12. "	"	106MC	"	106MC	"	A17, A18	Adjust for maximum deflection. Repeat steps 11 and 12.

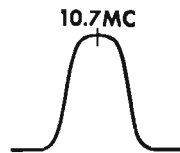


FIG. 1

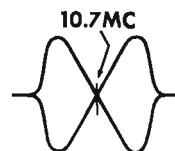


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp.	6AB4	
V2	FM Conv. - FM AFC	12AT7	
V3	1st. FM IF Amp.	9BA6	
V4	AM Converter	6BE6	

ITEM No.	USE	TYPE	NOTES
V5	2nd. FM - 1st AM IF Amp.	9BA6	
V6	FM Limiter - AM Det. - AVC	6AU6	
V7	Discriminator	6AL5	
V8	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Bell Sound PART No.	AEROVOX PART No.	CORNELL-DUBIERRE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	±20	450		AFH3-36	CO270	FP376.5	TMT-34	T-140	TVL-3780
B	±20	450							
C	±20	450							

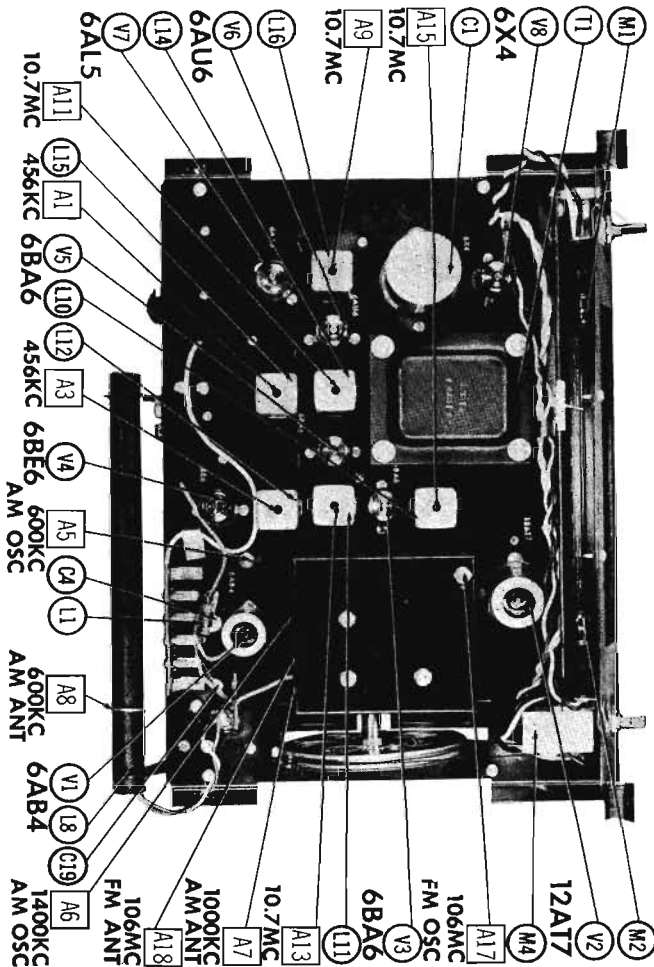
### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	Bell Sound PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBIERRE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	3.3			NPO-DI 3.3	DTZ-40	C10V33C	2T-5833	5TCCB-V33	NPO 10% ①
C3	12				TCZ-12	C10Q12C		5TCC-Q33	NPO 10%
C4	33			N750-DI 33	DTN-33	C10Q33U		3TCU-Q33	N750 10% ②
C5	270				D6-271	L10T27		M8-327	10%
C6	4.7			NPO-DI 4.7	DTZ-4R7	C10V47C	2T-5547	5TCCB-V47	NPO 10% ③
C7	2000			BPD-002	DD-202	BYA10D9	DCS22	5HK-D2	NPO 10% ④
C8	12				TCZ-12	C10Q12C			NPO 10% ②
C9	75				DD-750	L10Q75	UC-5475	5GA-Q75	③
C10	33			NPO-DI33	DTZ-33	C10Q33C	ZT-5433	5TCC-Q33	NPO 10%
C11	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C12	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	④
C13	10			N750-DI 10	DTN-10	C10Q1U	NT-541	5TCU-Q1	N750 10%
C14									
C15	2000			BPD-002	DD-202	BYA10D2	DCS22	5HK-D2	
C16	10				DTZ-10	C10Q1C	NT-531	5TCC-Q2	NPO 10%
C17	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C18	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	④
C19	2.2			NPO-SI 2.2	DTZ-2R2	C10V22C		5TCCB-V22	NPO ⑤
C20	2000					IR5D2	MCB457	M8-22	10%
C21	100			N750-DI 100	DTN-100	C10T1U	NT-531	5TCU-T1	N750 10%
C22	20			NPO-DI 20	DTZ-20	C10Q2C		5TCC-Q2	NPO 10% ④
C23	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C24	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	④
C25	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C26	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C27	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C28	3000					IR5D3	MCB461	MS-23	10%
C29	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C30	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C31	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C32	47			1469-000047	D6-470	22R5Q47		M8-447	10%
C33	47			N750-DI 47	DTN-47	C10Q47U		5TCU-Q47	N750 10%
C34	470				D6-471	5R0747		MS-347	10% ⑥
C35	.05	400		P488N-05	DD-503	CUB485	GEM-415	47M-S5	
C36	10000			BPD-01	DD-103	BYA6S1	DCS11	5HK-S1	
C37	.05	400		P488N-05	DD-503	CUB485	GEM-416	47M-S5	
C38	100			N750-DI 100	DTN-100	C10T1U	NT-531	5TCU-T1	N750 10%
C39	10			NPO-DI 10	DTZ-10	C10Q1C	ZT-541	5TCC-Q1	NPO 10%

- ① Some versions may use 4.7mmf in this application.
- ② Some versions may use 50mmf in this application.
- ③ Some versions may use 3.3mmf in this application.
- ④ Not used in some versions.
- ⑤ Some versions may use 1µmf in this application.
- ⑥ Some versions may use 270mmf in this application.

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Bell Sound PART No.	NOTES	ITEM No.	RATING		Bell Sound PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	47K				R16	10K			⑤
R2	270Ω				R19	10K			⑥
R3	56K				R20	47K			
R4	270Ω			①	R21	180K			
R5	470Ω				R22	120K			
R8	880Ω			②	R23	120K			
R7	47K			③	R24	1meg			⑦
R8	1500Ω			④	R25	1meg			
R9	120K	2			R26	320K			⑧
R10	22K				R27	470K			
R11	1000Ω				R28	47K			
R12	2200Ω			④	R29	370K			
R13	88Ω				R30	1000Ω	5(W/W)		③
R14	2200Ω				R31	1000Ω	5(W/W)		③
R15	10K				R32	1000Ω	5(W/W)		
R18	2.2meg				R33	68Ω			
R17	47K								

- ① Some versions may use 22K in this application.  
 ② Some versions may use 380Ω in this application.  
 ③ Not used in some versions.  
 ④ Some versions may use 8200Ω in this application.  
 ⑤ Some versions may use 47K in this application.  
 ⑥ Some versions may use 82K in this application.  
 ⑦ Some versions may use 2.2meg in this application.  
 ⑧ Some versions may use 1meg in this application.

### COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	Bell Sound PART No.	REPLACEMENT DATA
K1	Diode RF Filter	100mmf, 100mmf, 47K		Aerovox PA-87-1 Centralab PC-50 Cornell-Dubilier 1M1 Sprague D-1

### MISCELLANEOUS

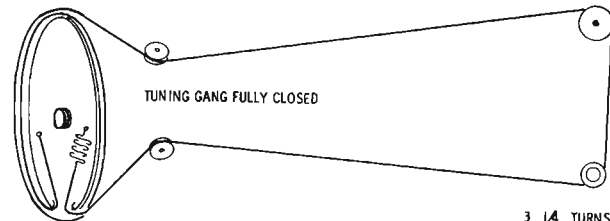
ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M1	Lamp		#44
M2	Lamp		#44
M3	Tuning Cap.		4 Gang (AM Sections: Ant. 24-838mmf, Osc. 15-180mmf)
M4	Switch		Power On-Off, Function Rotary, wafer type

### WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors  
 8534 (Stranded) Available in Ten Colors  
 Power Cord ..... Use BELDEN No. 1735-B (6 Ft. Length)  
 1725-K (7½ Ft. Length)

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		Bell Sound PART No.	Meissner PART No.	Marit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil						
L2	FM Ant. Coil						
L3	RF Choke		19-1007		4590		.68 Microhenry
L4	FM RF Coil				4590		.68 Microhenry
L5	RF Choke		19-1007				1.2 Microhenries
L6	RF Choke						
L7	FM Osc. Coil						
L8	Loop Stick						
L9	AM Osc. Coil						
L10	1st. FM IF	56-466	16-3467	FM-254	1463		
L11	2nd. FM IF	56-361	18-3467	FM-254	1463		
L12	1st. AM IF	56-364	15-6758				
L13	Flt. Choke			FM-254	1463		1.2 Microhenries
L14	3rd. FM IF	56-362	16-3467				
L15	2nd. AM IF	56-366	16-8758				
L16	Discriminator	56-383	17-3494 *	FM-253 *	1464 *		* Disconnect C32
L17	Line Choke		19-1000	BC-561	4802		1 Microhenry
L18	Line Choke		19-1000	BC-561	4802		1 Microhenry

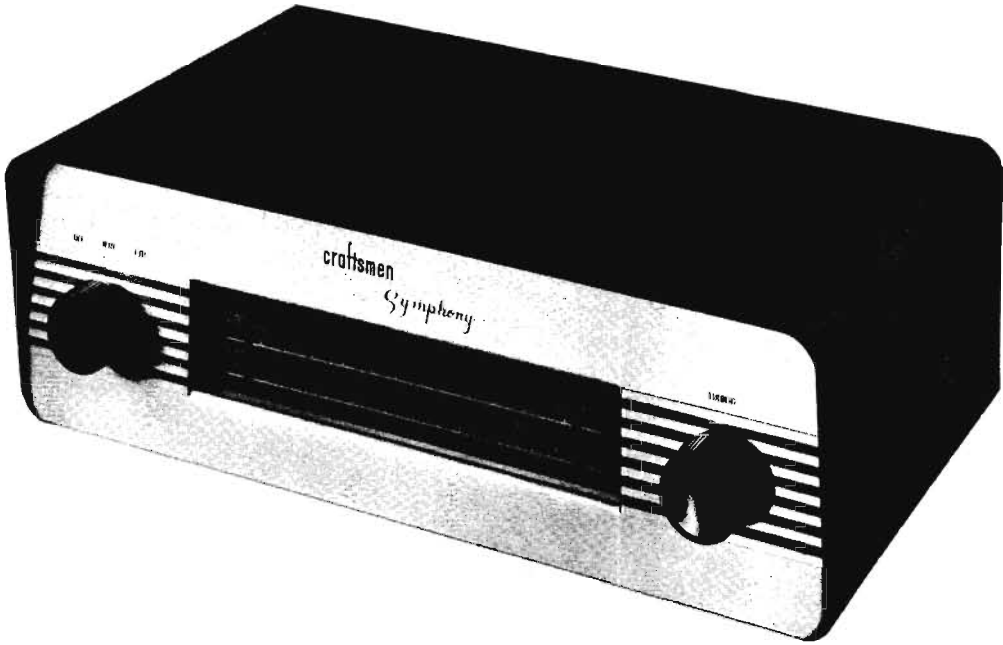


3 1/4 TURNS  
ON TUNING SHAFT

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Bell Sound PART No.	Holladson PART No.	Marit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ② .385A	500VCT ② .040A	6.3V ② 3A	32B17	P0213	P-3048		PM8419	24R12	

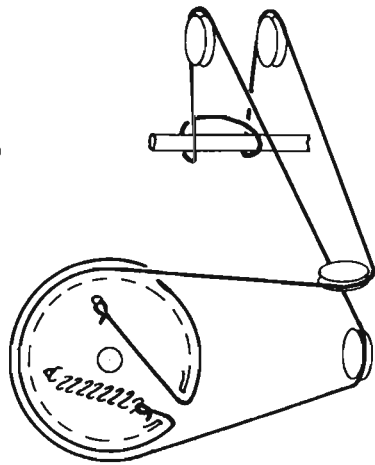
### DIAL CORD STRINGING



TRADE NAME	Craftsmen Model CT-4		
MANUFACTURER	Radio Craftsmen Inc., 4223 W. Jefferson Blvd., Los Angeles 16, Calif.		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Eight)	Types 6BQ7A FM RF Amp. -Mixer, 6U8 FM Osc. -AFC, 6BE6 AM Conv., 6BA6 1st. IF Amp., 6AU6 2nd. FM IF Amp. -AM Det. -AVC, 6AU6 3rd. FM IF Amp., 6AL5 Ratio Det., 6C4 AF Amp.		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	.35 Amp. @ 117 Volts AC (33 Watts)
TUNING RANGE - BROADCAST	540KC-1650KC	FREQ. MOD.	88MC-108MC

**CRAFTSMEN  
 MODEL CT-4**

TUNING GANG FULLY CLOSED



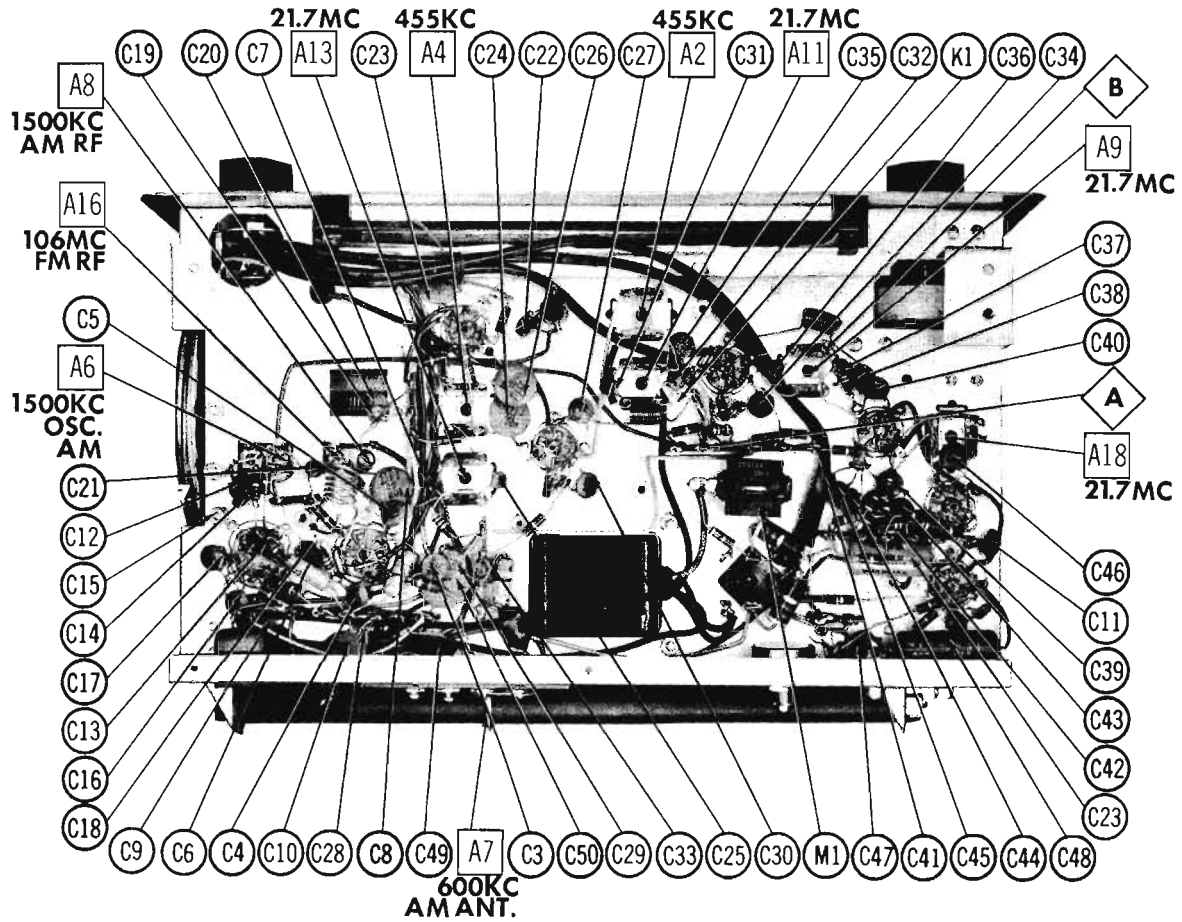
**DIAL CORD STRINGING**

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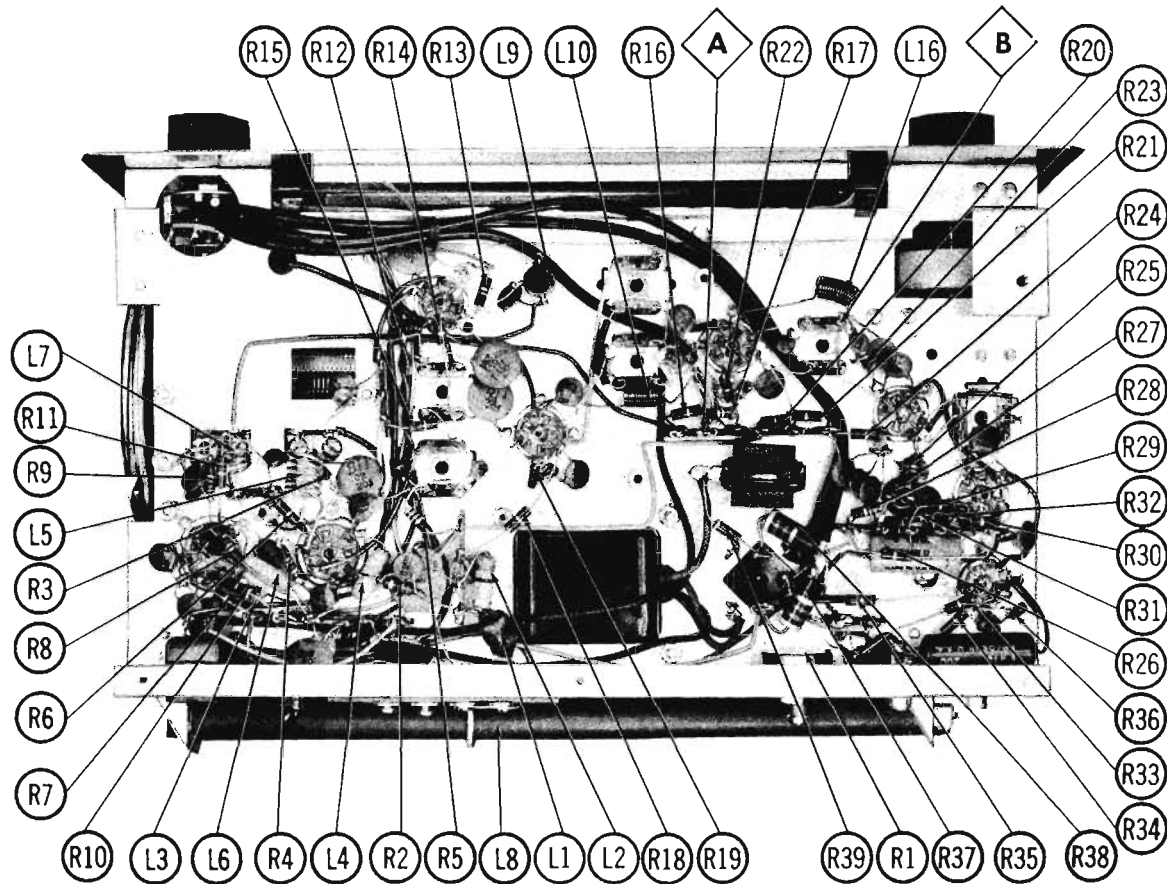
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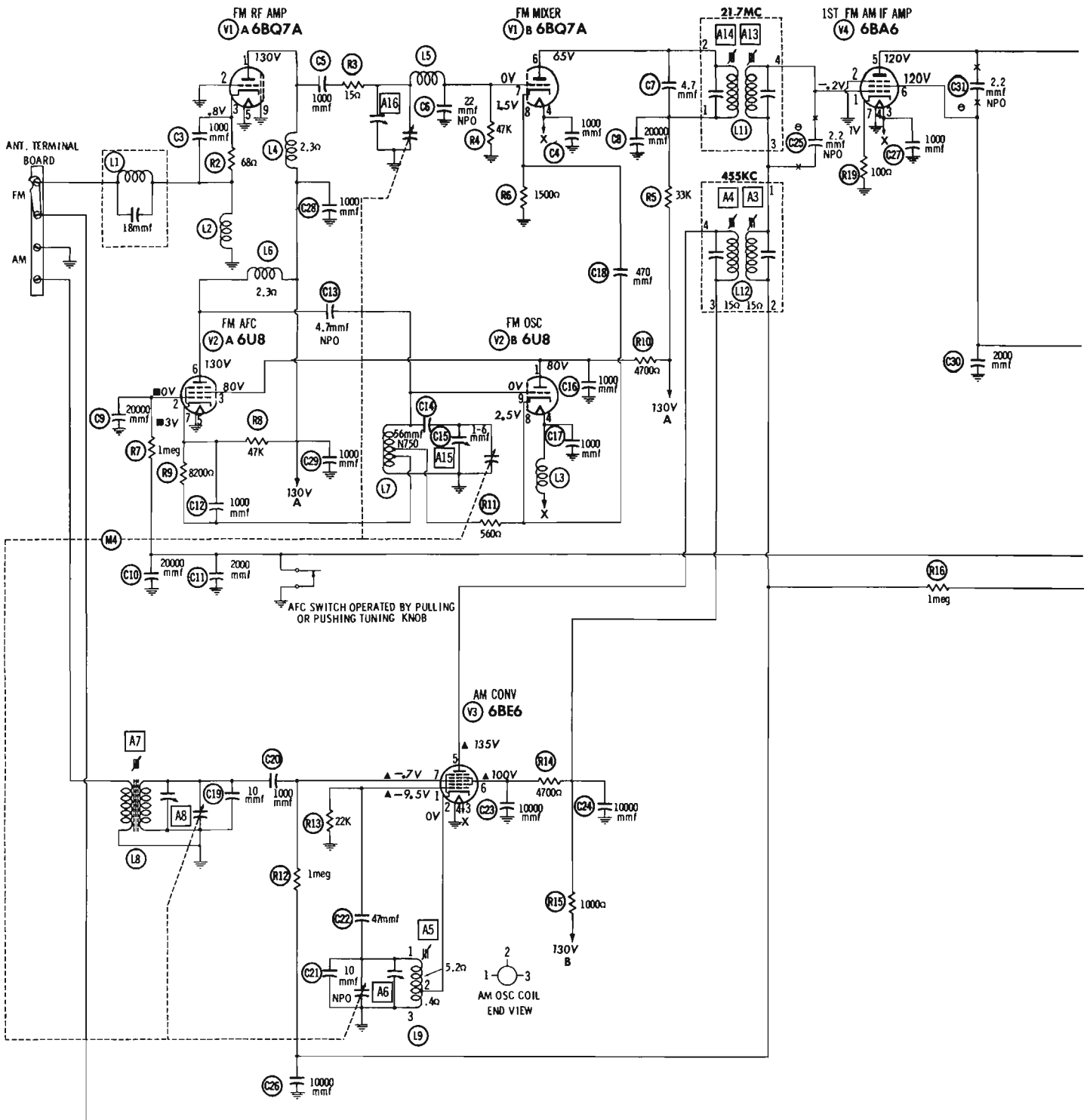




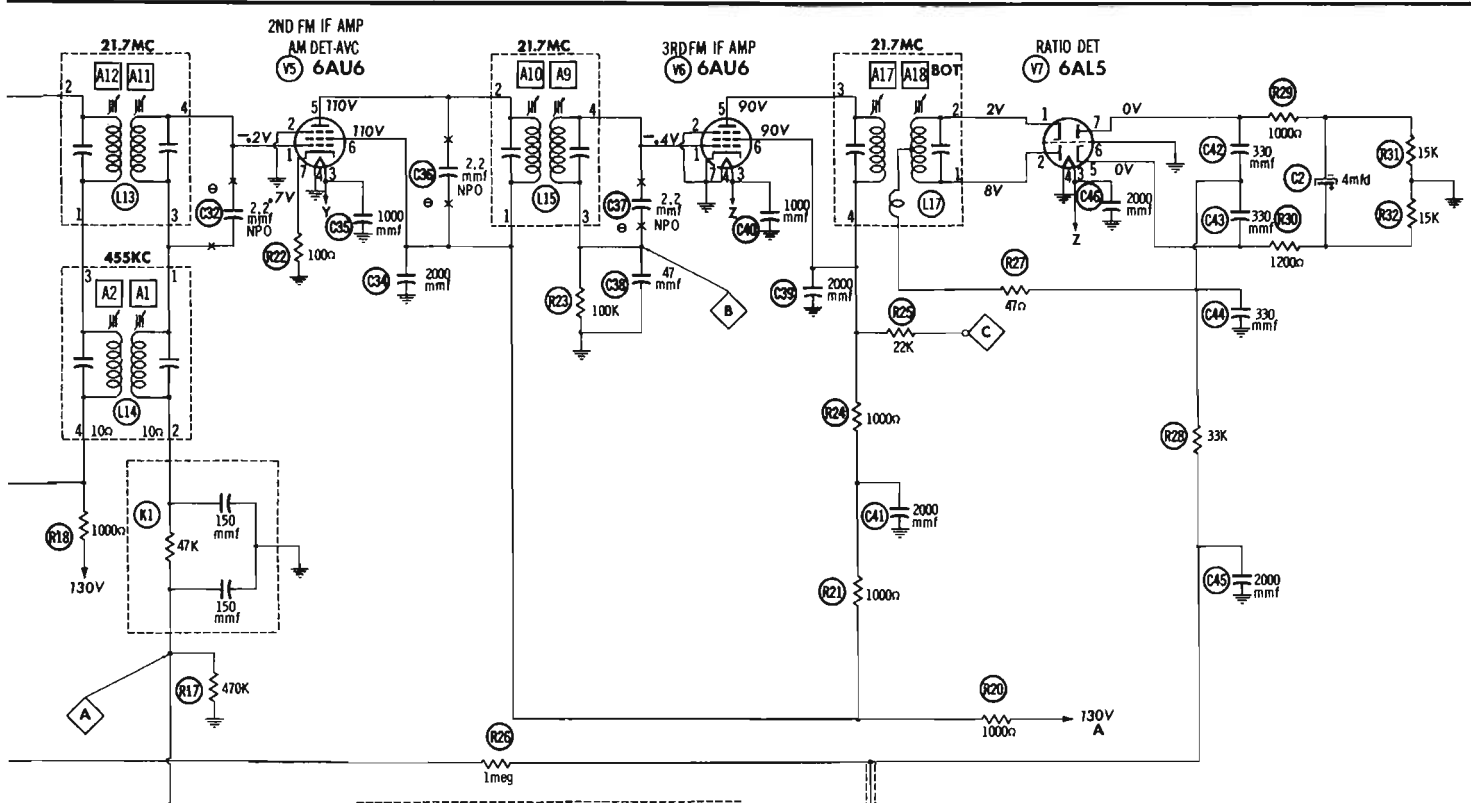
CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**

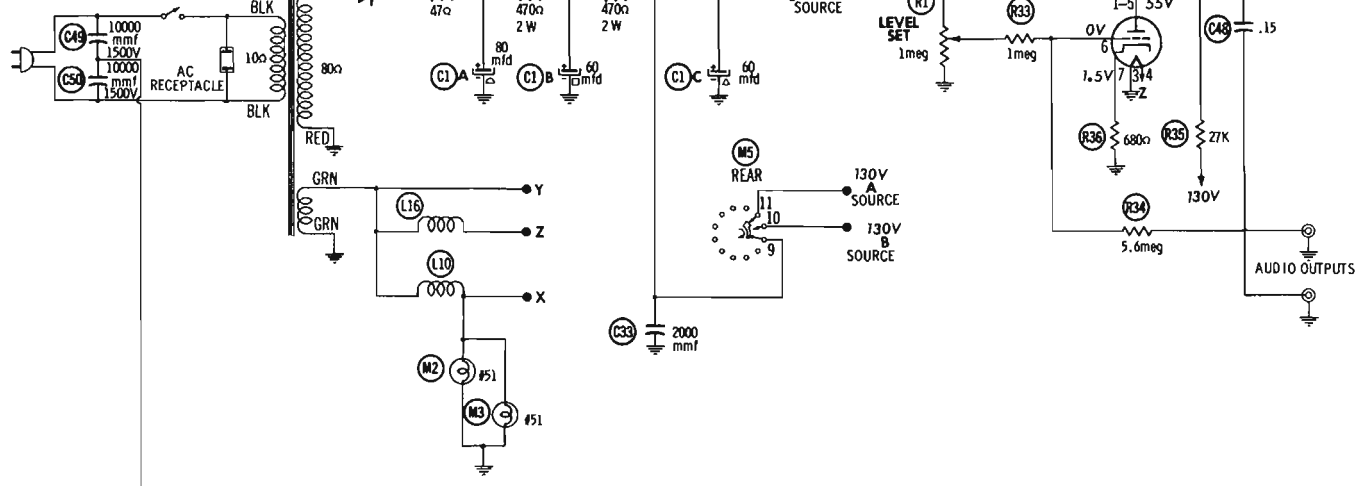


A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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FUNCTION SELECTOR SWITCH M5 SHOWN IN FM POSITION  
SWITCH SEQUENCE:  
1. FM  
2. AM  
3. OFF

ON-OFF SWITCH PART OF FUNCTION SELECTOR SWITCH M5



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BQ7A	† 985Ω	0Ω	68Ω	.1Ω	0Ω	† 34K	47K	1500Ω	0Ω
V2	6U8	† 5700Ω	■ 1NF 1Meg	† 5700Ω	.1Ω	0Ω	† 985Ω	820Ω	560Ω	0Ω
V3	6BE6	22K	.4Ω	.1Ω	0Ω	▲ † 2000Ω	▲ † 6700Ω	2.4Meg		
V4	6BA6	1.4Meg	0Ω	.1Ω	0Ω	† 2000Ω	† 2000Ω	100Ω		
V5	6AU6	510K	0Ω	.1Ω	0Ω	† 2000Ω	† 2000Ω	100Ω		
V6	6AU6	100K	0Ω	.1Ω	0Ω	† 4000Ω	† 4000Ω	0Ω		
V7	6AL5	■ 1NF 1Meg	■ 1NF 1Meg	.1Ω	0Ω	16K	0Ω	16K		
V8	6C4	† 28K	0Ω	0Ω	.1Ω	† 28K	1.6Meg	680Ω		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED  
† MEASURED FROM OUTPUT OF M1  
▲ MEASURED IN AM POSITION  
■ MEASURED IN AFC POSITION

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.

# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.  
With gang fully closed set dial pointer to dial base line at left end of dial.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. 01MFD	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (unmod.)	AM	Point of non-interference	DC probe to point A. Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2. 220MMF	High side to AM Antenna terminal. Low side to chassis.	600KC	"	600KC	"	A5	"
3. "	"	1500KC	"	1500KC	"	A6	Adjust for maximum deflection. Repeat steps 2 & 3.
4. "	"	600KC	"	600KC	"	A7	Adjust for maximum deflection.
5. "	"	1500KC	"	1500KC	"	A8	Adjust for maximum deflection. Repeat steps 4 & 5.

### FM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6. 100MMF	High side to pin 7 (grid) of 6BQ7A (V1). Low side to chassis.	21.7MC (unmod.)	FM	Point of non-interference	DC probe to point B. Common to chassis.	A9, A10, A11, A12, A13, A14	Adjust for maximum deflection.
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
7. 270Ω Carbon Resistor	High side to FM Antenna terminal. Low side to chassis.	90MC (250KC Swp)	FM (AFC Off)	90MC	Vert Amplifier to point C. Low side to chassis.	L7	Compress or expand coil turns so that 90MC marker appears at peak of response curve similar to Fig. 1.
8. "	"	106MC	"	106MC	"	A15	Adjust so that 106MC marker appears at peak of response curve similar to Fig. 1. Repeat steps 7 & 8.
9. "	"	90MC	"	90MC	"	L5	Compress or expand coil turns for curve of maximum amplitude and symmetry similar to Fig. 1.
10. "	"	106MC	"	106MC	"	A16	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1. Repeat steps 9 & 10.
11. "	"	98MC	"	Tune to 98MC signal	Vert Amplifier to audio output jack.	A17, A18	Adjust A18 so that 98MC occurs at center of crossover lines similar to Fig. 2. Adjust A17 for maximum amplitude and straightness of crossover lines.

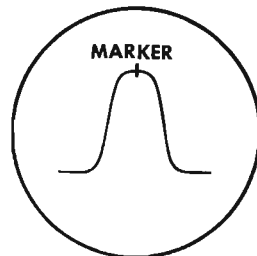


FIG. 1

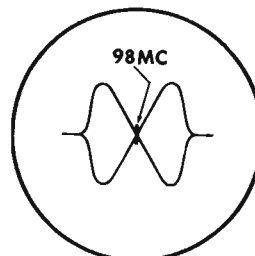


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier-FM Mixer	6BQ7A		V5	2nd. FM IF Amplifier-AM Det.-AVC	6AU8	
V2	FM Osc. -FM AFC	8U8		V8	3rd. FM IF Amplifier	6AL5	
V3	Am Converter	6BE6		V7	Ratio Detector AF Amplifier	6C4	
V4	1st. IF Amplifier	6BA8					

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		CRAFTSMEN PART No.	REPLACEMENT DATA					SPRAGUE PART No.
	CAP.	VOLT.		AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	±60	150	CEX-12		XC0123	FPI38	TMD-22	Q-005	R2429 *
B	±60	150				TCD-498	TD-80-150	MTD-302	
C	±60	150							
4	25			PRSI50V4	BBR4-50	TC30	TD-4-25	MT-5094	TVA-1203

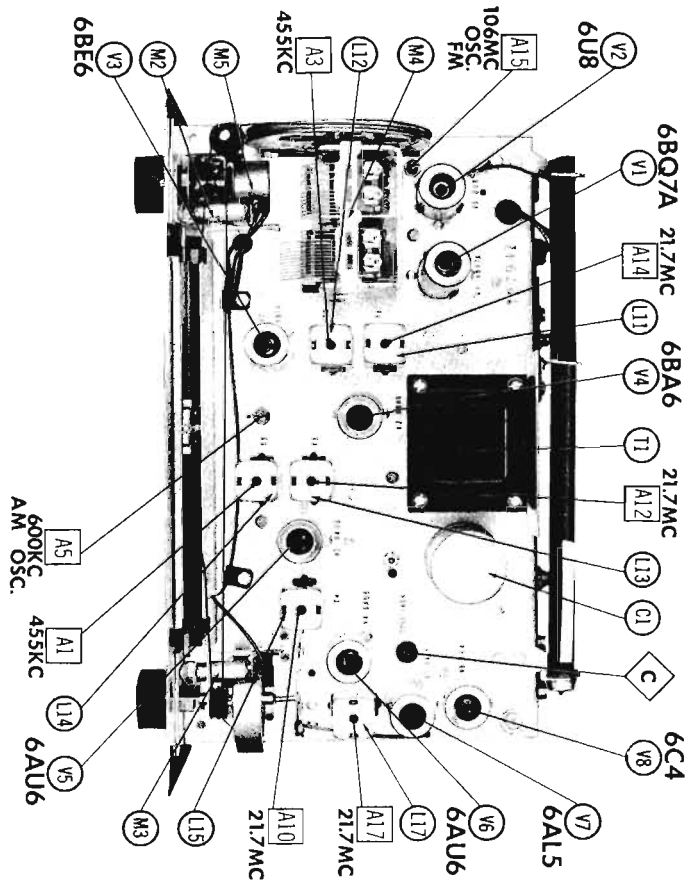
### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		CRAFTSMEN PART No.	REPLACEMENT DATA					NOTES	
	CAP.	VOLT.		AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.		SPRAGUE PART No.
C3	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C4	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C5	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C6	22			NPO-SI 22	TCZ-22	C10Q22C	TCO-22	5TCCB-Q22		NPO
C7	4.7			NPO-SI 4.7	TCZ-4R7	C10V47C	TCO-4.7	5TCCB-V47		
C8	20000			BPD-02	DD-203	BYB6S2	ED-02	5HK-S2		
C9	20000			BPD-02	DD-203	BYB6S2	ED-02	5HK-S2		
C10	20000			BPD-02	DD-203	BYB6S2	ED-02	5HK-S2		
C11	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C12	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C13	4.7			NPO-SI 4.7	TCZ-4R7	C10V47C	TCO-4.7	5TCCB-V47		NPO
C14	56			N750-SI 56	TCN-56	C10Q88U	TC7-56			N750
C15	1-8			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C16	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C17	1000			BPD-00047	DD-471	L10T47	ED-470	UC-5347	5GA-T47	
C18	470			BPD-00001	DD-100	L10Q1	ED-10	UC-541	5GA-Q1	
C19	10			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C20	1000			NPO-SI 10	TCZ-10	C10Q10	TCO-10	5TCC-Q10		NPO
C22	47			BPD-00047	DD-470	L10Q47	ED-47	UC-5447	5GA-Q47	
C23	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C24	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C25	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2	5TCCB-V22		NPO ⊕
C26	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C27	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C28	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C29	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C30	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C31	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2	5TCCB-V22		NPO ⊕
C32	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2	5TCCB-V22		NPO ⊕
C33	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C34	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C35	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C36	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2	5TCCB-V22		NPO ⊕
C37	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2	5TCCB-V22		NPO ⊕
C38	47			BPD-00047	DD-470	L10Q47	ED-47	UC-5447	5GA-Q47	
C39	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C40	1000			BPD-001	DD-102	BYA6DI	ED-1000	DC521	5HK-D1	
C41	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C42	330			BPD-00033	DD-331	L10T33	ED-330	UC-5333	5GA-T33	
C43	330			BPD-00033	DD-331	L10T33	ED-330	UC-5333	5GA-T33	
C44	330			BPD-00033	DD-331	L10T33	ED-330	UC-5333	5GA-T33	
C45	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C46	2000			BPD-002	DD-202	BYA10D2	ED-1000	DC522	5HK-D2	
C47	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	
C48	15	200		P288N-15		CUB2P15		GEM-2015	27M-P15	
C49	10000	1500		P1888N-10	DD16-103	CUB18S1		GEM-1811	18B-S1	
C50	10000	1500		P1888N-01	DD16-103	CUB18S1		GEM-1811	18B-S1	

⊕ Not used in some versions.

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued) CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	CRAFTSMEN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLOY PART No.	
R1A B	1Meg 5Watt	1/2	P-11	AB-09 AK-1	A47-1Meg-5 PKS-1/4	QU-137 RQ	BU-54 Not req.	Level Set

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES	ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CRAFTSMEN PART No.	IRC PART No.			OHMS	WATT	CRAFTSMEN PART No.	IRC PART No.	
R2	68K			BTS-58		R21	1000Ω			BTS-1000	
R3	15K			BTS-15		R22	100K			BTS-1000	
R4	47K			BTS-47K		R23	100K			BTS-100K	
R5	33K			BTS-33K		R24	1000Ω			BTS-1000	
R6	1500Ω			BTS-1500		R25	22K			BTS-22K	
R7	1Meg			BTS-1Meg		R26	1Meg			BTS-1Meg	
R8	47K			BTS-47K		R27	47Ω			BTS-47	
R9	820Ω			BTS-820		R28	33K			BTS-33K	
R10	4700Ω			BTS-4700		R29	1000Ω			BTS-1000	
R11	560Ω			BTS-560		R30	1200Ω			BTS-1200	
R12	1Meg			BTS-1Meg		R31	15K			BTS-15K	
R13	22K			BTS-22K		R32	15K			BTS-15K	
R14	4700Ω			BTS-4700		R33	1Meg			BTS-1Meg	
R15	1000Ω			BTS-1000		R34	5.6Meg			BTS-5.6Meg	
R16	1Meg			BTS-1Meg		R35	27K			BTS-27K	
R17	470K			BTS-470K		R36	880Ω			BTS-880	
R18	1000Ω			BTS-1000		R37	470Ω	2		BTB-470	
R19	100Ω			BTS-100		R38	470Ω	2		BTB-470	
R20	1000Ω			BTS-1000		R39	47Ω			BTS-47	

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	CRAFTSMEN PART No.	Holladson PART No.	Merit PART No.	Stencor PART No.	Thorderson PART No.	Triad PART No.
T1	117VAC ②.35	150VAC ②.049A	8.3VAC ②2.7A		T-29					

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		CRAFTSMEN PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	IF Trap	T-40				3 Microhenries; Wound On 18 MMFCap
L2	RF Choke	53A043	19-1000	BC-561	4602	1 Microhenry; IRC Part #CLA
L3	Fl. Choke	53A051	19-1000	TV-189	4602	.75 Microhenry
L4	RF Choke	53A046				3.3Microhenries; IRC Part #CLA
L5	FM RF Coil	T-43				3.3 Microhenries; IRC Part #CLA
L6	RF Choke	53A046				
L7	FM Osc. Coil	T-44				
L8	Loop Stick	T-35				
L9	AM Osc. Coil	T-36				
L10	Fl. Choke	53A051	19-1000	TV-189	4602	.75 Microhenry
L11	1st FM IF	T-31				
L12	1st AM IF	T-33	16-6758	BC-352	12-C1	
L13	2nd FM IF	T-31				
L14	2nd AM IF	T-34	16-6758	BC-353	12-C2	
L15	3rd FM IF	T-31				
L16	Fl. Choke	53A051	19-1000	TV-189	4602	.75 Microhenry
L17	Ratio Det.	T-32				

## PARTS LIST AND DESCRIPTIONS (Continued) COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	CRAFTSMEN PART No.	REPLACEMENT DATA
K1	Det. RF Filter	150MMF, 150MMF, 47K	CCX-1	Aarvok PA-98 Centralab PC-51 Cornell Dubilier IUTM2 Erie 1403-02 Sprague D-3

### SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	CURRENT (Measured)	WATT	CRAFTSMEN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLOY PART No.	
M1	.049A		CR-11	1089	8RS085Q	8S75	

### MISCELLANEOUS

ITEM No.	PART NAME	CRAFTSMEN PART No.	NOTES
M2	Dial Light		#51
M3	Dial Light		#51
M4	Tuning Cap.	CAX-6	4 Gang (AM Sections: Ant. 25-565MMF, Osc. 30-90MMF)
M5	Switch	SW-40	On-Off, Function (Rotary Wafer Type)

### CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

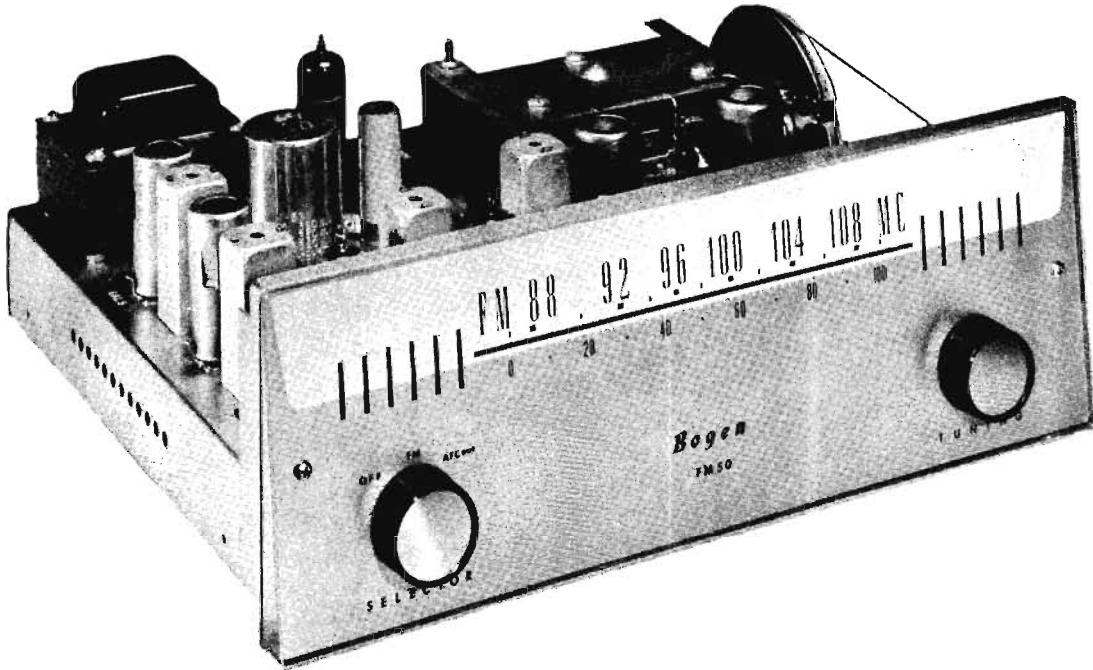
NAME	PART NO.	DESCRIPTION
Knob	N-12	Push-On Type
Knob	N-13	Set Screw Type
Dial Glass	DN-68	
Dial Pointer	82A009	



**PHOTOFACT\*** Folder  
TRADE MARK



**DAVID BOGEN  
 MODEL FM50**



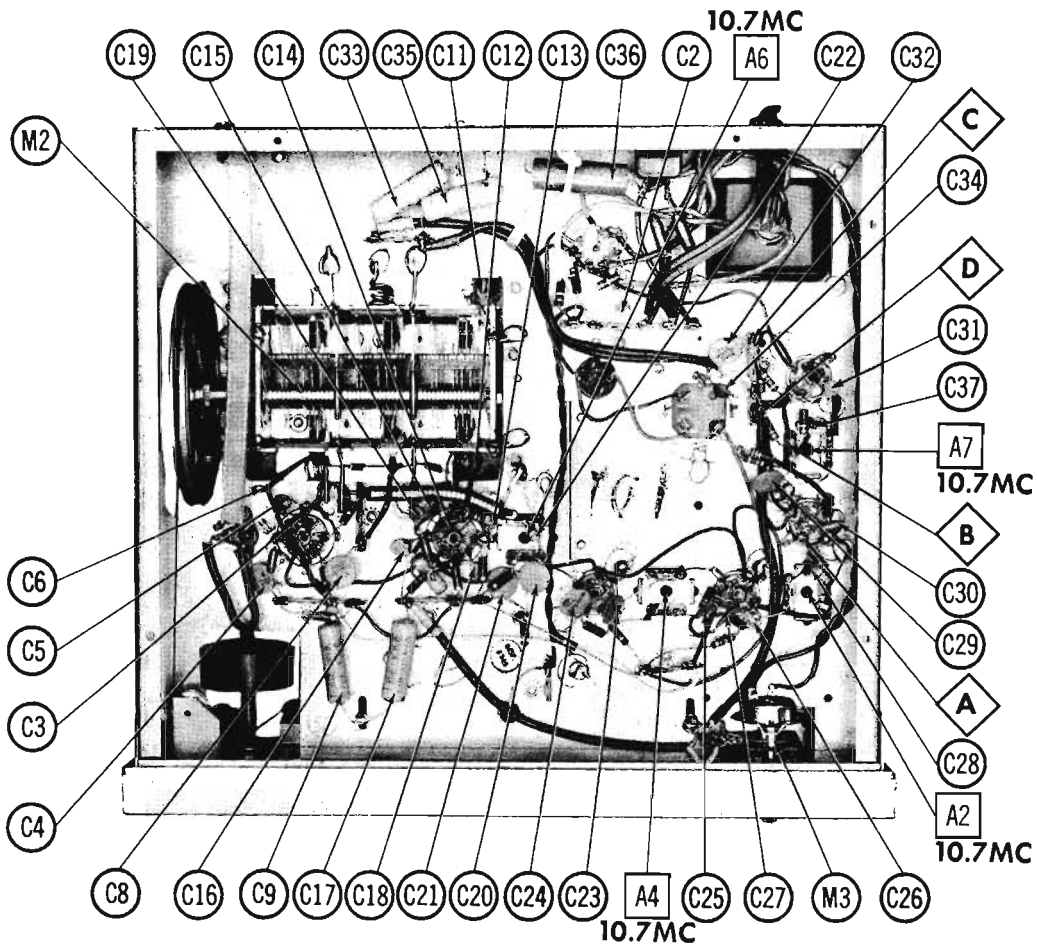
**DAVID BOGEN  
 MODEL FM50**

<b>TRADE NAME</b>	David Bogen Model FM50	
<b>MANUFACTURER</b>	David Bogen Co., Inc., 29 Ninth Ave., New York 14, N. Y.	
<b>TYPE SET</b>	AC Operated FM Superheterodyne Tuner	
<b>TUBES (Seven)</b>	Types 12AT7 RF Amplifier-Mixer, 6U8 Oscillator-AFC, 6AU6 1st IF Amplifier, 6AU6 2nd IF Amplifier, 6AU6 Limiter, 6AL5 Discriminator, 6X4 Rectifier	
<b>POWER SUPPLY</b>	105-125 Volts AC - 60 Cycles	<b>RATING</b> .27 Amp. @ 117 Volts AC
<b>TUNING RANGE--FM</b>	88MC - 108MC	

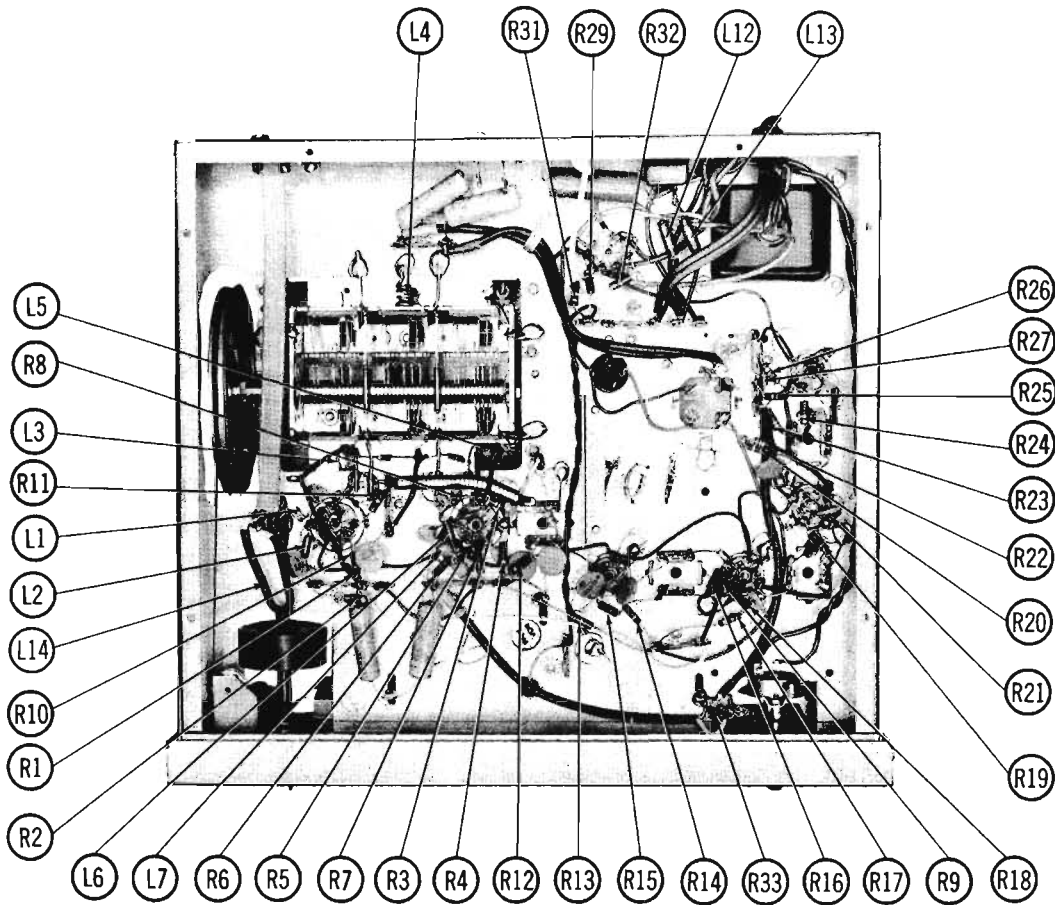
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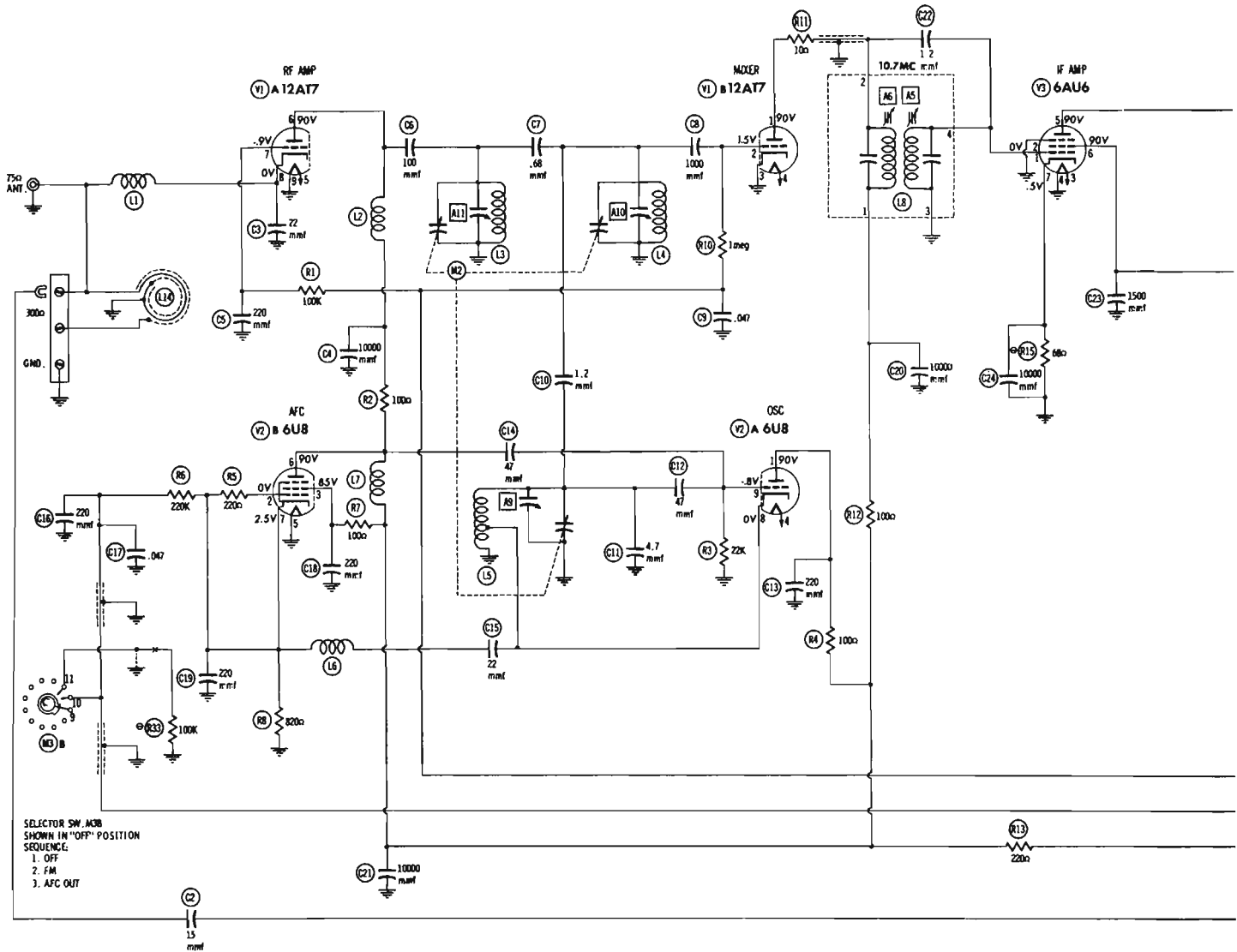
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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**



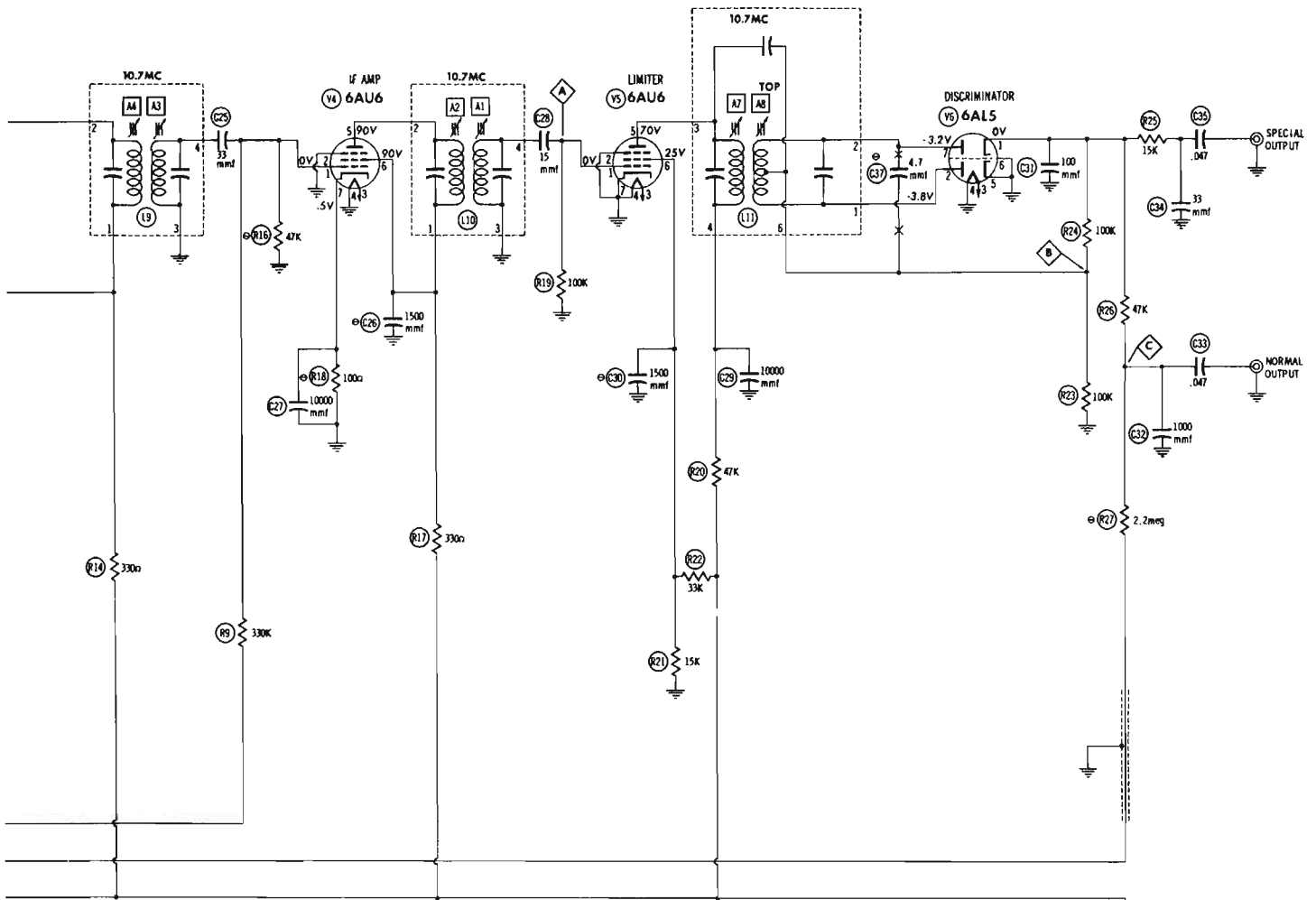
SELECTOR SW, AC3B  
SHOWN IN "OFF" POSITION  
SEQUENCE:  
1. OFF  
2. FM  
3. AFC OUT

RESISTANCE READINGS

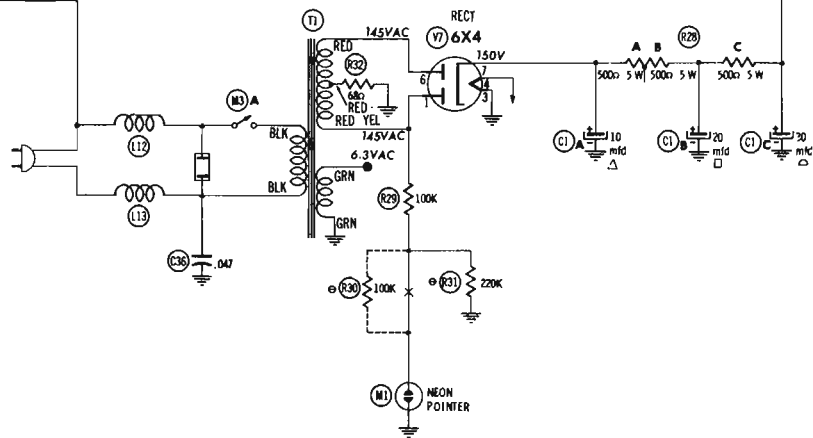
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AT7	†1800Ω	1.4Meg	0Ω	.1Ω	.1Ω	†1800Ω	470K	0Ω	0Ω
V2	6U8	†1800Ω	1200Ω	†1800Ω	.1Ω	0Ω	†1700Ω	820Ω	0Ω	22K
V3	6AU6	.8Ω	0Ω	.1Ω	0Ω	†1800Ω	†1800Ω	68Ω		
V4	6AU6	47K	0Ω	.1Ω	0Ω	†1800Ω	†1800Ω	100Ω		
V5	6AU6	100K	0Ω	.1Ω	0Ω	†48K	†34K	0Ω		
V6	6AL5	200K	100K	.1Ω	0Ω	0Ω	0Ω	100K		
V7	6X4	160Ω	NC	0Ω	.1Ω	TP	160Ω	12K		

† MEASURED FROM PIN 7 OF V1.  
NC NO CONNECTION.  
TP TIE POINT

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pins to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values in like possible a variation of ± 1% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.



SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION



# ALIGNMENT INSTRUCTIONS

**ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

**FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM**

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01MFD	High side to pin 2 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (unmod)	FM	Point of non-interference.	DC probe thru 100K to point $\Delta$ . Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum deflection.
2. "	"	"	"	"	DC probe thru 100K to point $\ominus$ . Common to chassis.	A7	"
3. "	"	"	"	"	DC probe thru 100K to point $\diamond$ . Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

**FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE**

Use frequency-modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1. .01MFD	High side to pin 2 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference.	Vert. amp. thru 100K to point $\Delta$ . Low side to chassis.	A1, A2, A3, A4, A5, A6	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2. "	"	"	"	"	Vert. amp. thru 100K to point $\ominus$ . Low side to chassis.	A7	"
3. "	"	"	"	"	Vert. amp. thru 100K to point $\diamond$ . Low side to chassis.	A8	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines.

**FM RF ALIGNMENT**

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4. Fig. 3	Antenna connection as shown in Fig. 3.	106MC	FM	106MC	DC probe thru 100K to point $\Delta$ . Common to chassis.	A9, A10, A11	Short AFC to ground at junction of C16 and C17. Adjust for maximum deflection.

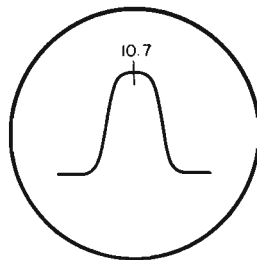


FIG. 1

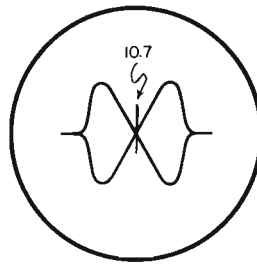


FIG. 2

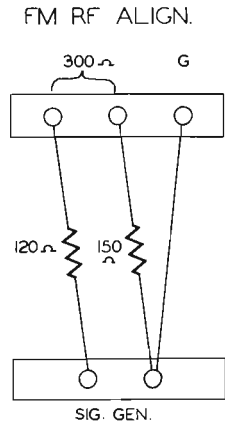
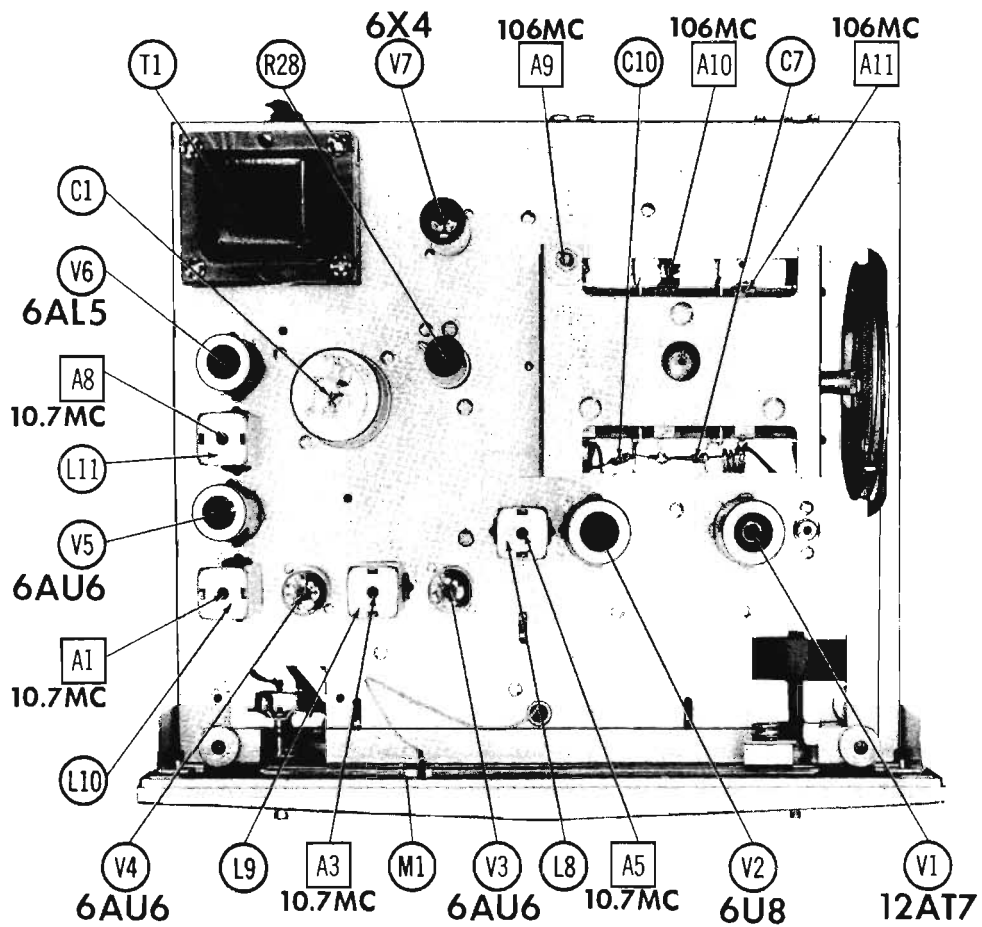
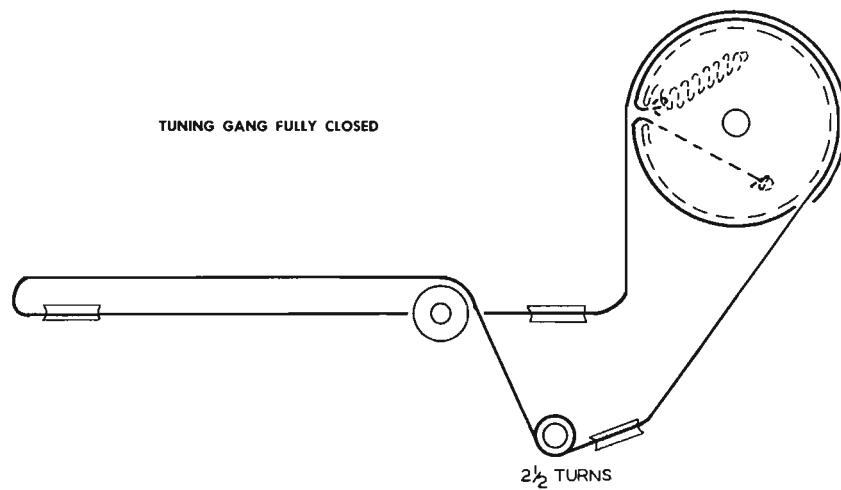


FIG. 3



CHASSIS TOP VIEW



DIAL CORD STRINGING



## PARTS LIST AND DESCRIPTIONS TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amp.-Mixer	12AT7	
V2	Oscillator-AFC	6U6	
V3	1st IF Amplifier	6AU6	
V4	2nd IF Amplifier	6AU6	

ITEM No.	USE	TYPE	NOTES
V5	Limiter	6AU6	
V6	Discriminator	6AL5	
V7	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲10	350							
B	▲20	350	AFB3-153-30	D042	FP343.8	TMQ-11	Q-035	R2250*	
C	▲30	350				TD-12-350	FM-3512		

\* Non catalog item.

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C2	15										
C3	25										
C4	10000										
C5	220										
C6	100										
C7	.88										
C8	1000										
C9	.047	200									
C10	1.2										
C11	4.7										
C12	47										
C13	220										
C14	47										
C15	22										
C16	220										
C17	.047	200									
C18	220										
C19	220										
C20	10000										
C21	10000										
C22	1.2										
C23	1500										
C24	10000										
C25	33										
C26	1500										
C27	10000										
C28	15										
C29	10000										
C30	1500										
C31	100										
C32	1000										
C33	.047	200									
C34	33										
C35	.047	200									
C36	.047	500									
C37	4.7										

Note 1: Some versions may use .01MFD in this application.  
Note 2: Not used in some versions.

## PARTS LIST AND DESCRIPTIONS (Continued) RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA				NOTES	ITEM No.	RATING		REPLACEMENT DATA				NOTES
	OHMS	WATT	David Bogen		IRC				OHMS	WATT	David Bogen		IRC		
			PART No.	PART No.	PART No.	PART No.					PART No.	PART No.			
R1	100K						R18	100G							
R2	100G						R19	100K							
R3	22K						R20	47K							
R4	100G						R21	15K							
R5	220G						R22	33K							
R6	220K						R23	100K							
R7	100G						R24	100K							
R8	820G						R25	15K							
R9	330K						R26	47K							
R10	1Mmeg						R27	2.2Meg							
R11	100						R28A	500G	5						
R12	100G						B	500G	5						
R13	220G						C	500G	5						
R14	330G						R29	100K							
R15	68G						R30	100K							
R16	47K						R31	220K							
R17	330G						R32	88G							
							R33	100K							

Note 1: Some versions use 100K in this application.  
Note 2: Some versions use 68G in this application.  
Note 3: Some versions use 1Meg in this application.  
Note 4: Not used in some versions.

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	David Bogen PART No.	Haldorson PART No.	Merit PART No.	Stencor PART No.	Thorderson PART No.	Triad PART No.
T1	117VAC @.27A	300VCT @.034A	6.3VAC @2.75A		T375-LA					22R36 □

□ Tape 6. 3VCT.

### COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	David Bogen PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Loading Coll	0G		U346				
L2	RF Choke	0G		U420				1.7 Microhenries
L3	Ant. Coil	0G		U441				
L4	RF Coil	0G		U434				
L5	Osc. Coil	0G		U443				
L6	RF Choke	0G		U432	19-1000			Tapped 1.1 Microhenries 3.3 Microhenries; IRC part #CLA
L7	RF Choke	3G		U507				
L8	1st IF Trans.	.8G	.8G	H-355	18-3487	FM-254	1463	
L9	2nd IF Trans.	.8G	.8G	H-355	18-3487	FM-254	1463	
L10	Limiter	.8G	.8G	H-355	18-3487	FM-254	1463	
L11	Discriminator	.8G	.8G	H-295	17-3494	FM-253	1464	
L12	Line Choke	.1G	.8GCT	U512				1.9 Microhenries
L13	Line Choke	.1G		U512				1.9 Microhenries
L14	Ant. Matching Coll	0G		B456				

### MISCELLANEOUS

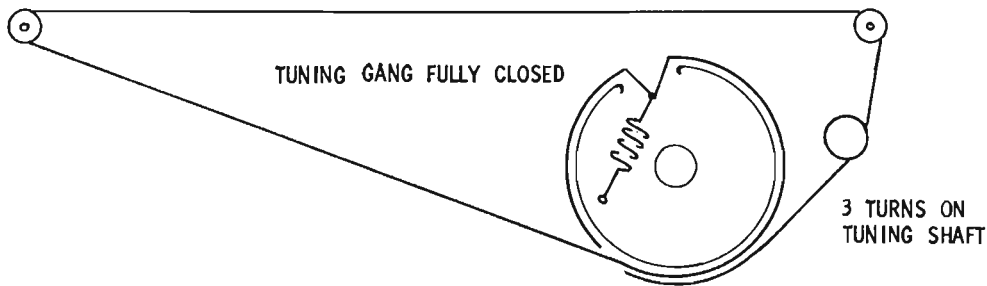
ITEM No.	PART NAME	David Bogen PART No.	NOTES
M1	Neon Bulb	C639A	Dial Pointer
M2	Tuning Cap.	S435A	3 Gang
M3A	Switch		On-Off (Power) SPST
M3B	Switch		Selector (SP-3 Position; Rotary, Wafer Type)



DEWALD MODEL  
 L-803A

TRADE NAME	DeWald Model L-803A		
MANUFACTURER	DeWald Radio Mfg. Corp., 35-15 37th Ave., Long Island City 1, N. Y.		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Seven)	Types 6U8A FM RF Amp.-FM Mixer, 12AT7 FM Osc.-FM AFC, 6BE6 AM Converter, 6BA6 1st FM AM IF Amp., 6AU6 2nd FM IF Amp.-AM Det.-AVC, 6AU6 FM Limiter, 6AL5 Discriminator		
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING	.28 Amp. @ 117 Volts AC (26 Watts) FM
TUNING RANGE - BROADCAST	535 - 1650KC	FREQ. MOD.	88 - 108MC

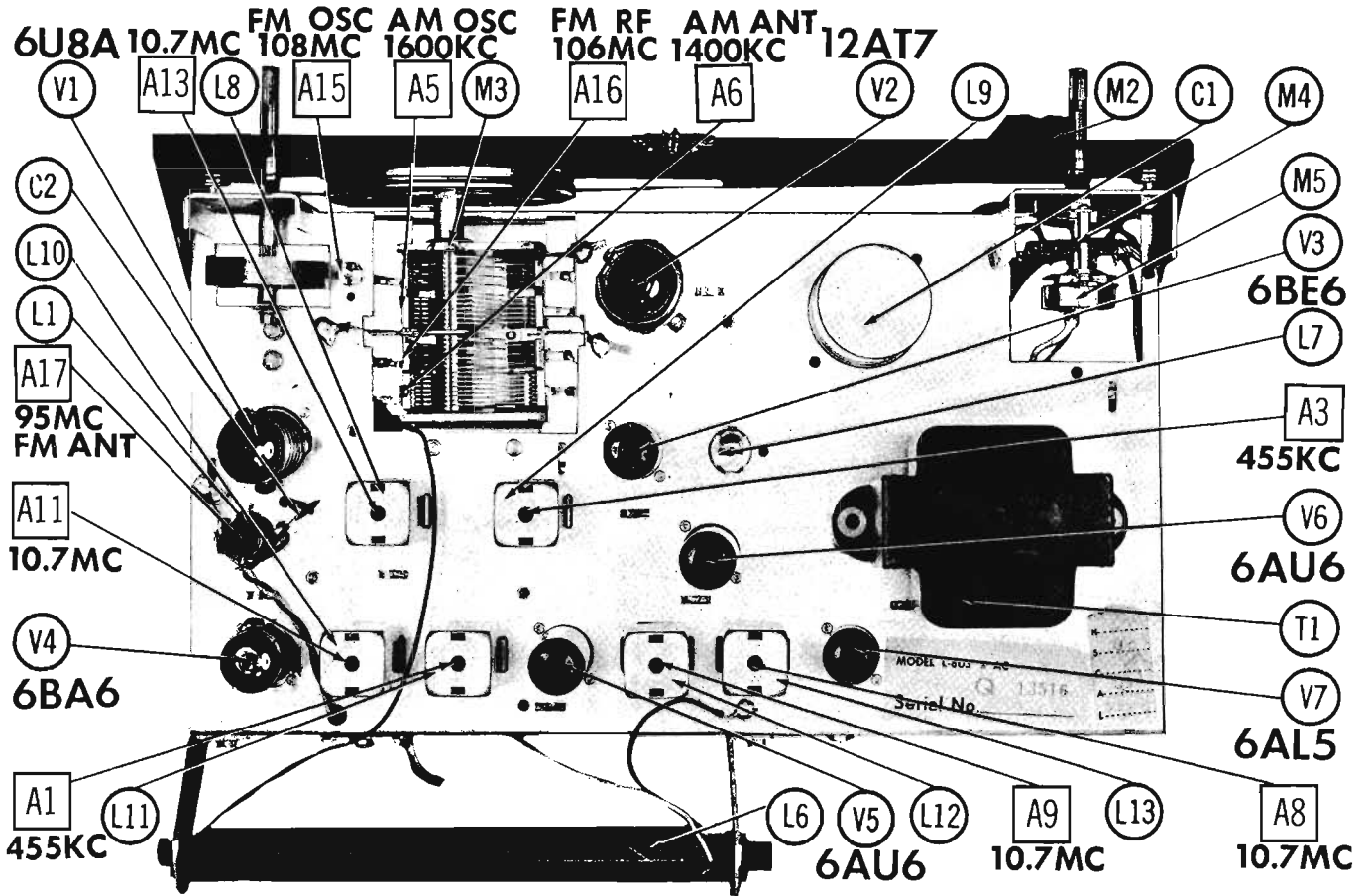
### DIAL CORD STRINGING



**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H647

the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana. Printed in U.S. of America



# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01mf	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (400% Mod)	AM	Tuning gang fully open	DC probe to point (A). Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2. "	High side to AM antenna terminal. Low side to chassis.	1600KC	"	1600KC	"	A5	"
3. "	"	1400KC	"	Tune to 1400KC signal	"	A6	"

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4. 200mf	High side to pin 1 (grid) of 6AU6 (V8). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe thru 1meg to point (B). Common to chassis.	A7	Adjust for maximum deflection.
5. "	"	"	"	"	DC probe to point (C). Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
6. "	High side to pin 9 (grid) of 6U8 (V1). Low side to chassis.	"	"	"	DC probe thru 1meg to point (B). Common to chassis.	A9, A10, A11, A12, A13, A14	Adjust for maximum deflection.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4. 200mf	High side to pin 1 (grid) of 6AU6 (V8). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. thru 1meg to point (B). Low side to chassis.	A7	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5. "	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A8	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines.
6. "	High side to pin 9 (grid) of 6U8 (V1). Low side to chassis.	"	"	"	Vert. Amp. thru 1meg to point (B). Low side to chassis.	A9, A10, A11, A12, A13, A14	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.

### FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7. 270Ω Carbon Resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	108MC (Unmod)	FM	108MC	DC probe thru 1meg to point (B). Common to chassis.	A15	Adjust for maximum deflection.
8. "	"	106MC	"	Tune to 106MC signal	"	A16	"

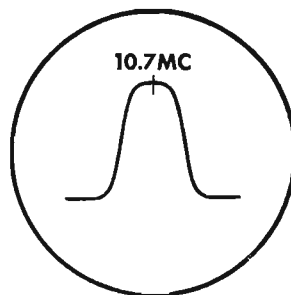


FIG. 1

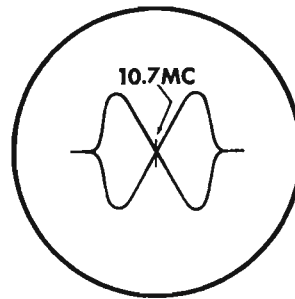
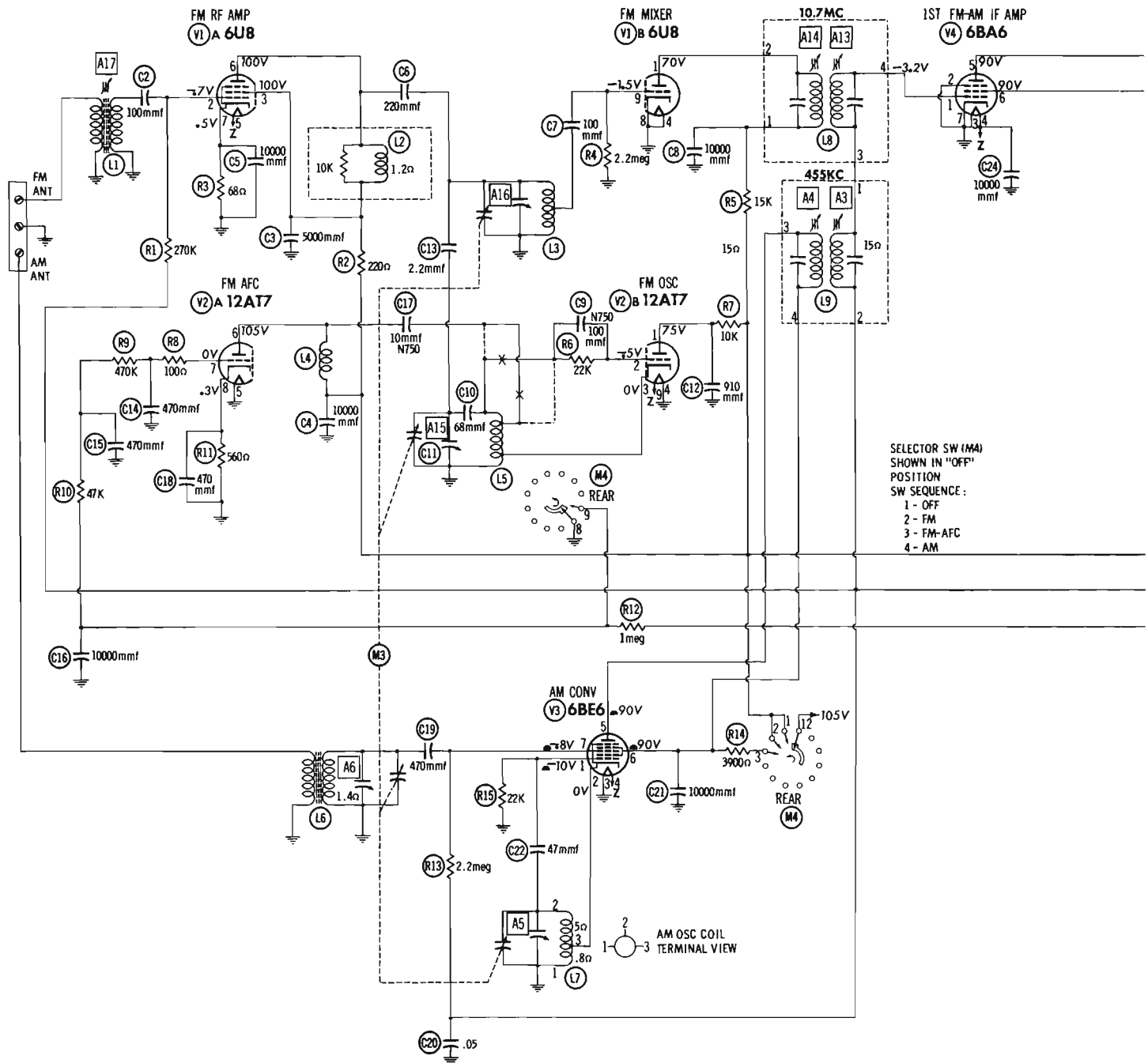


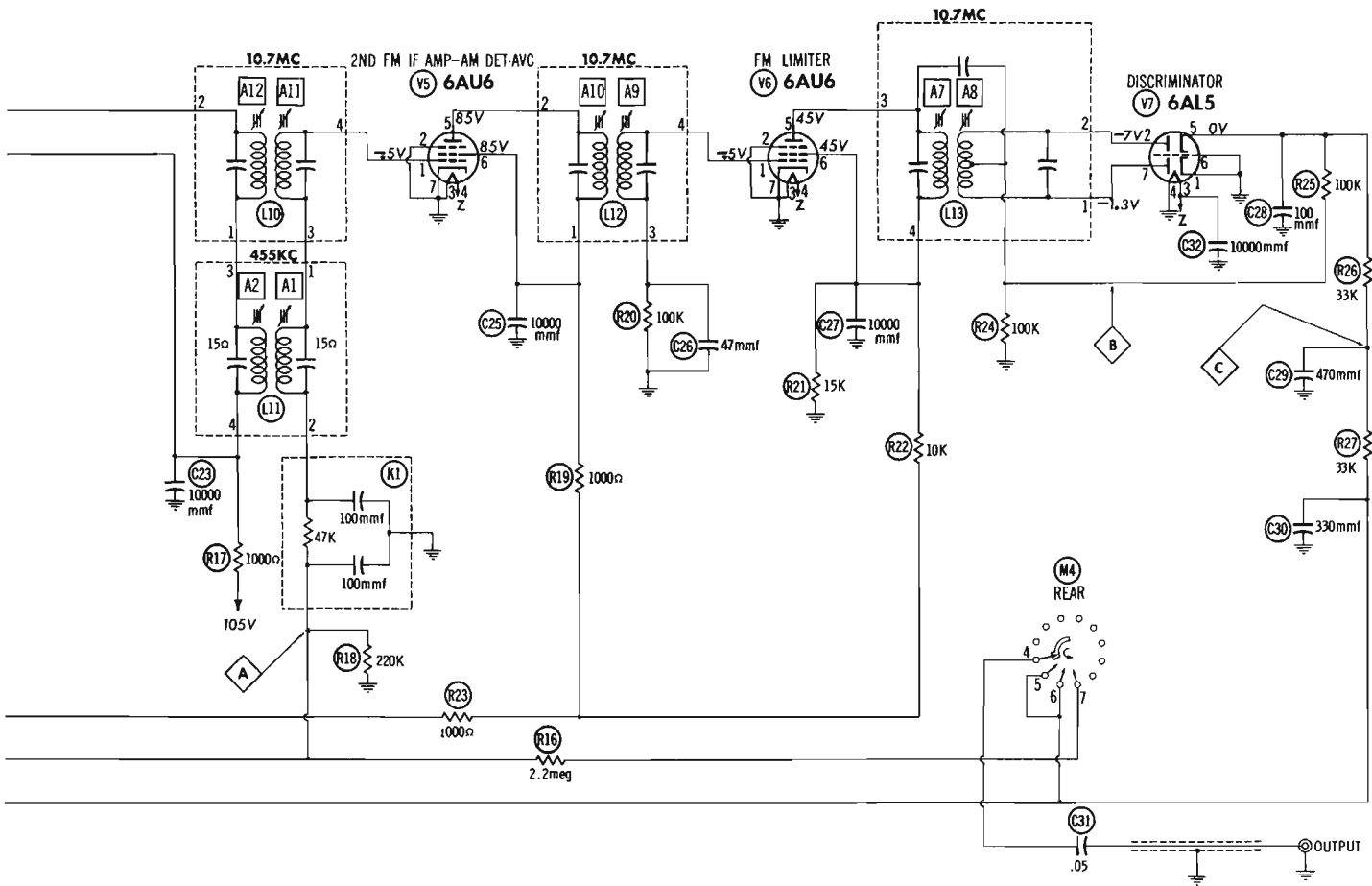
FIG. 2



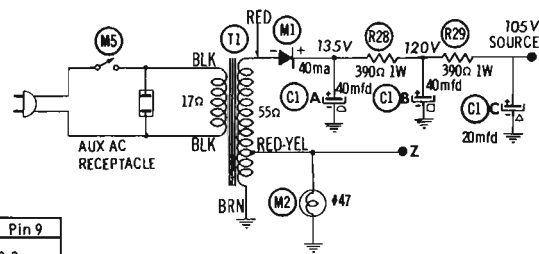
SELECTOR SW (M4)  
SHOWN IN "OFF"  
POSITION  
SW SEQUENCE:  
1 - OFF  
2 - FM  
3 - FM-AFC  
4 - AM

⊙ SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION  
  
DC COIL RESISTANCE VALUES UNDER ONE OHM  
NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFAC STANDARD NOTATION SCHEMATIC  
© Howard W. Sams & Co., Inc. 1958



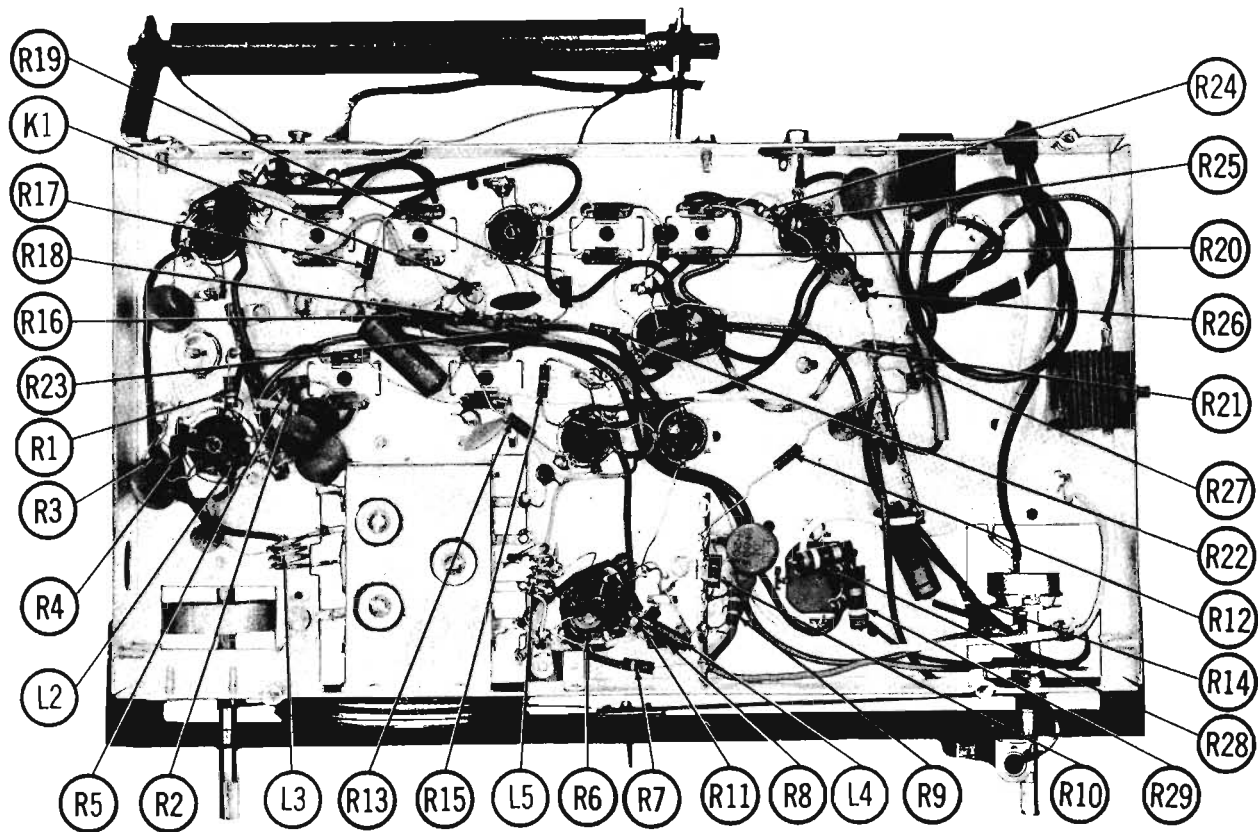
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.



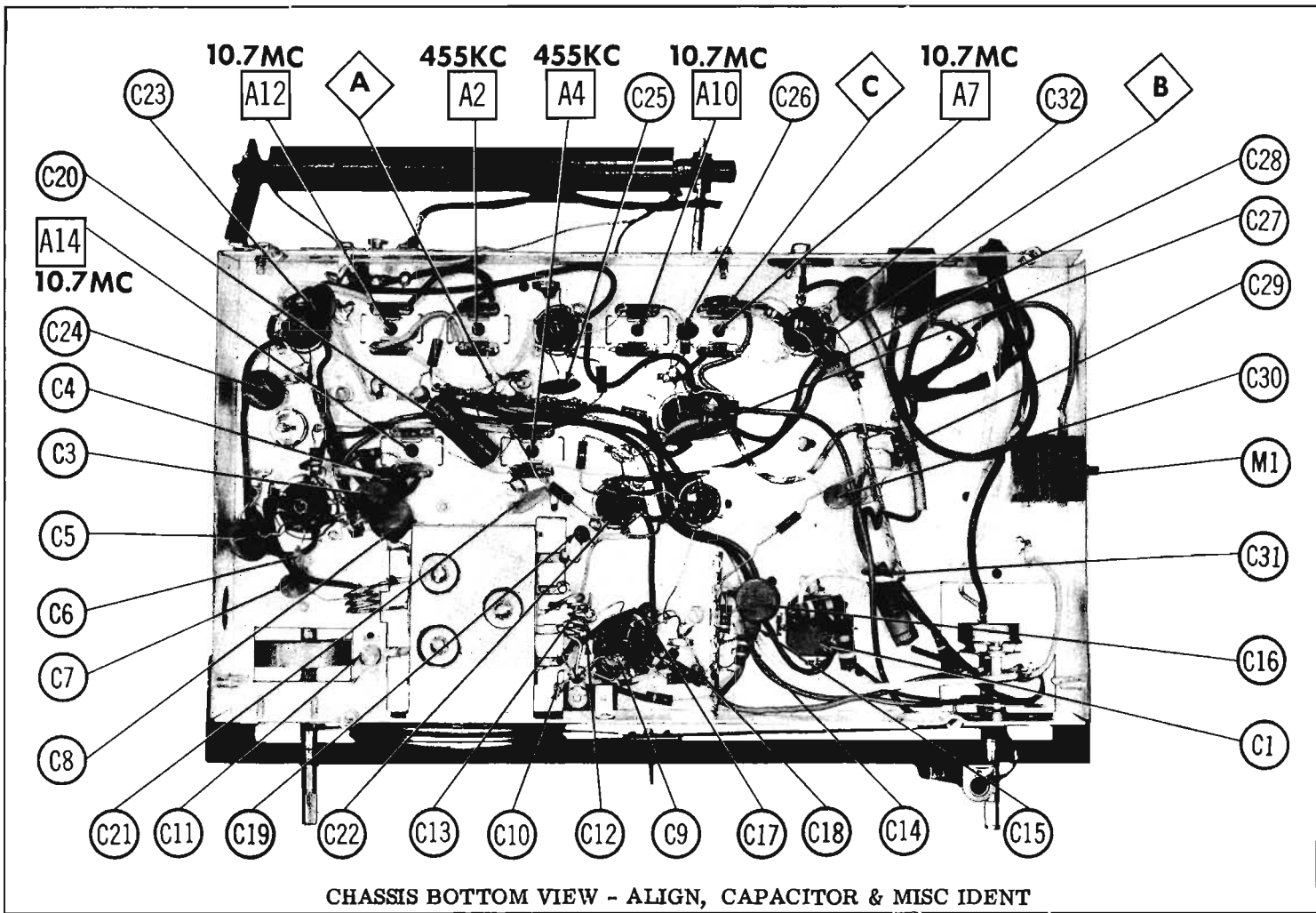
RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6U8A	† 15K	2.7meg	† 1000Ω	0Ω	.1Ω	† 1000Ω	68Ω	0Ω	2.2meg
V2	12A17	† 10K	22K	0Ω	0Ω	0Ω	† 800Ω	520K	560Ω	.1Ω
V3	6BE6	≈ 22K	≈ .8Ω	0Ω	.1Ω	† ≈ 4700Ω	† ≈ 4700Ω	≈ 4.6meg		
V4	6BA6	2.4meg	0Ω	0Ω	.1Ω	† 1800Ω	† 1800Ω	0Ω		
V5	6AU6	260K	0Ω	0Ω	.1Ω	† 2800Ω	† 2800Ω	0Ω		
V6	6AU6	100K	0Ω	0Ω	.1Ω	† 10K	† 10K	0Ω		
V7	6AL5	0Ω	100K	.1Ω	0Ω	160K	0Ω	100K		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.  
 † MEASURED FROM OUTPUT OF M1  
 ≈ MEASURED IN "AM" POSITION



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION





## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, PENNSYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp. - FM Mixer	6U8A		V5	2nd FM IF Amp. -		
V2	FM Osc. - FM AFC	12AT7		V6	AM Det. - AVC	6AU6	
V3	AM Converter	6BE6		V7	FM Limiter	6AU6	
V4	1st FM-AM IF Amplifier	6BA6			Discriminator	9AL5	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA							
	CAP.	VOLT.	DEWALD PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.	
C1A	.40	200		AFH83-94	CO150	FP320	TMT-19	T-085	R2877*	
B	.40	200			BR3025	TC55	TD-30-250	MT-4530		
C	.20	200								

\* Non-Catalog Item

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	DEWALD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	SPRAGUE PART No.	
C2	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	N750
C3	5000			BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C4	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C5	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C6	220			BPD-00022	DD-221	L10T22	UC-5322	5GA-T22	
C7	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C8	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C9	100			N750-DD100	DD-100	C10T1U	NT-531	5TCU-T1	
C10	88			S168	DD-680	L1T9Q88	UC-5468	5GA-Q68	
C11	910								
C12	2.2			NPO-S12.2	TC2-2R2	CTA8V22C	5TCCB-V22	5GA-T47	N750
C13	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C14	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C15	470			BPD-01	DD-103	BYA681	DC511	5BK-81	
C16	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C17	10			N750-DD10	DD-101	C10Q1U	NT-541	5TCU-Q1	
C18	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C19	470			BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C20	.05	200		P288N-05	DF-503	CUB285	GBM-415	2TM-86	
C21	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C22	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	
C23	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C24	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C25	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C26	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	
C27	10000			BPD-01	DD-103	BYA681	DC511	5BK-81	
C28	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C29	470			BPD-00047	DD-470	L10Q47	UC-5347	5GA-T47	
C30	330			BPD-00033	DD-330	L10T33	UC-5333	5GA-T33	
C31	.05	200		P288N-05	DF-503	CUB285	GBM-415	2TM-85	
C32	10000			BPD-01	DD-103	BYA681	DC511	5HK-S1	

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		DEWALD PART No.	NOTES	ITEM No.	RATING		DEWALD PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	270K				R16	2.2meg			
R2	220Q				R17	1000Q			
R3	88Q				R18	220K			
R4	2.2meg				R19	1000Q			
R5	15K				R20	100K			
R6	22K				R21	15K			
R7	10K				R22	10K			
R8	100Q				R23	1000Q			
R9	470K				R24	100K			
R10	47K				R25	100K			
R11	500Q				R26	33K			
R12	1meg				R27	33K			
R13	2.2meg				R28	390Q	1		
R14	3900Q				R29	390Q	1		
R15	22K								

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		DEWALD PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.		
L1	FM Ant. Trans.						4.7 Microhenries; wound on a 10K resistor	
L2	RF Choke			SW-831 *				
L3	FM RF Coil		10-1002	BC-563	4606		2.7 Microhenries	
L4	RF Choke							
L5	FM Osc. Coil						RF-1	
L6	Loop Stick							
L7	AM Osc. Coil						RF-2	
L8	1st FM IF		16-3487	FM-254	1463			
L9	1st AM IF		16-8758	BC-352	12-C1			
L10	2nd FM IF		16-3487	FM-254	1463			
L11	2nd AM IF		16-8758	BC-353	12-C2			
L12	3rd FM IF		16-3487	FM-254	1463			
L13	Discriminator		17-3491	FM-253	1464			

\* Parallel with 10K Resistor.

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PR1	SEC. 1	SEC. 2	DEWALD PART No.	Holderson PART No.	Merit PART No.	Rom PART No.	Stencor PART No.	Thorderson PART No.	Triod PART No.
T1	117V	120V	0.040A	PT-157	P9102	P-3045		PA8421	28R38	R-30X
	⊕ .28A	⊕ 2.3A	Tap							

### COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	DEWALD PART No.	REPLACEMENT DATA
X1	Diode RF Filter	100mmf, 100mmf, 47K		Aerovox Centralab Cornell-Dubilier Sprague
				PA-97-1 PC-50 111TMI D-1

### SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA					NOTES
	CURRENT (Measured)	DEWALD PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARIAN PART No.			
M1	.04A		1234AB	R8075	75 M150 ⊕		⊕ Silicon Type	

### MISCELLANEOUS

ITEM No.	PART NAME	DEWALD PART No.	NOTES
M2	Lamp		#47
M3	Tuning Cap.	222-2	4 Gang (AM Sections: Ant. 12-247mmf, Osc. 13-122mmf)
M4	Switch		Selector, Four position, Three pole rotary wafar
M5	Switch		Power On-Off, Rotary Sump Switch

### WIRING DATA

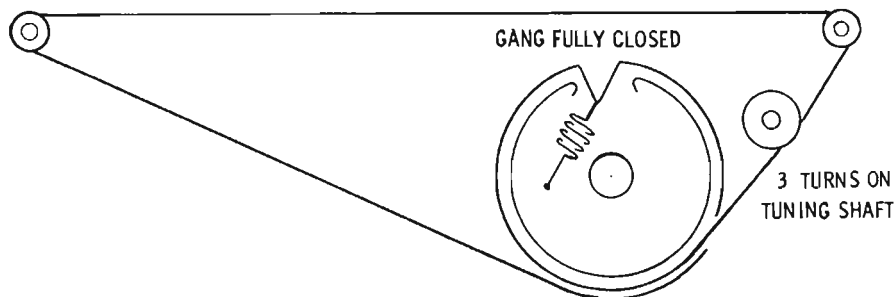
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8630 (Solid) Available in Ten Colors  
 8524 (Stranded) Available in Ten Colors  
 Power Cord ..... Use BELDEN No. 1785-B (6 Ft. Length)  
 1725-K (7 1/2 Ft. Length)



DEWALD MODEL  
M-804

TRADE NAME	DeWald Model M-804		
MANUFACTURER	DeWald Radio Mfg. Corp., 35-15 37th Ave., Long Island City 1, N. Y.		
TYPE SET	AC Operated FM Tuner		
TUBES (Seven)	Types 6U8A RF Amp. - Mixer, 12AT7 Osc. - AFC, 6BA6 1st IF Amplifier, 6AU6 2nd IF Amplifier, 6AU6 Limiter, 6AL5 Discriminator, EM80/6BR5 Tuning Indicator		
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING	.285 Amp. @ 117 Volts AC (26 Watts)
TUNING RANGE - FREQ. MOD.	88 - 108MC		

## DIAL CORD STRINGING



### HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H682

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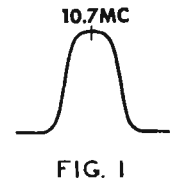
# ALIGNMENT INSTRUCTIONS

**ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

**IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM**

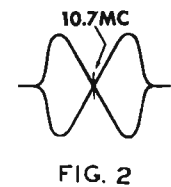
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. 200mmf	High side to RF stator lug of tuning gang. Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference	DC probe to point (A) Common to chassis.	A1, A2, A3, A4, A5, A6, A7	Adjust for maximum deflection.
2. "	"	"	"	"	DC probe to point (B) Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.



**IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE**

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

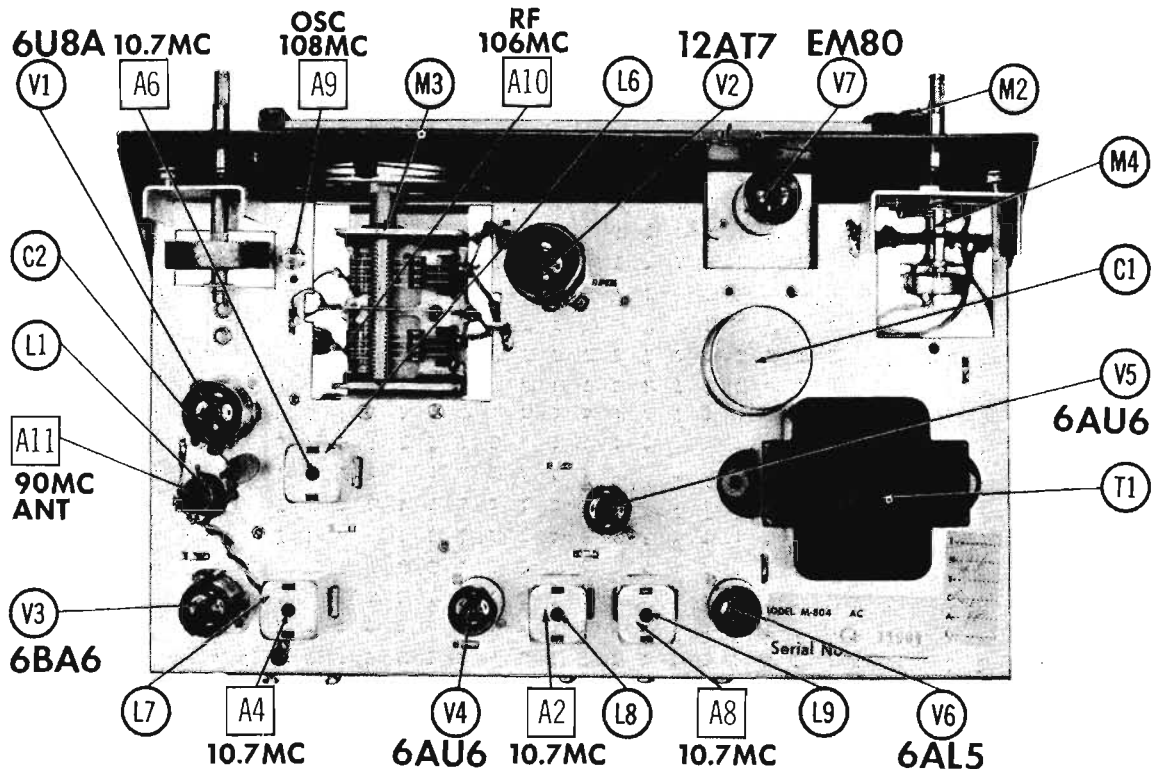
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1. 200mmf	High side to RF stator lug of tuning gang. Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. thru 1meg res. to point (A) Low side to chassis.	A1, A2, A3, A4, A5, A6, A7	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2. "	"	"	"	"	Vert. Amp. thru 1meg res. to point (B) Low side to chassis.	A8	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A1 for maximum amplitude and straightness of crossover lines.

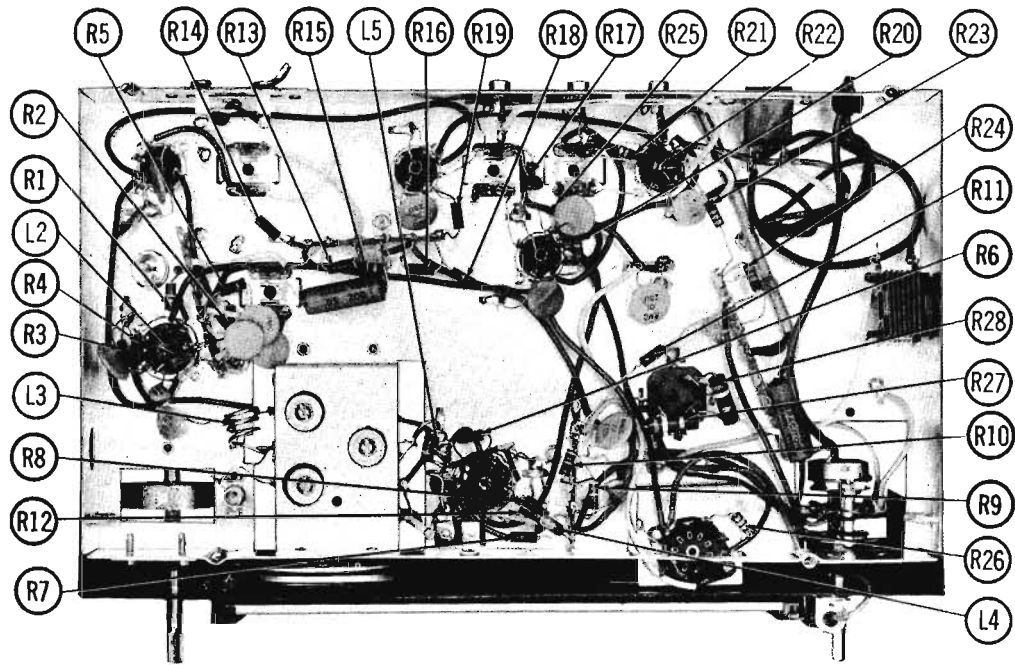


**RF ALIGNMENT**

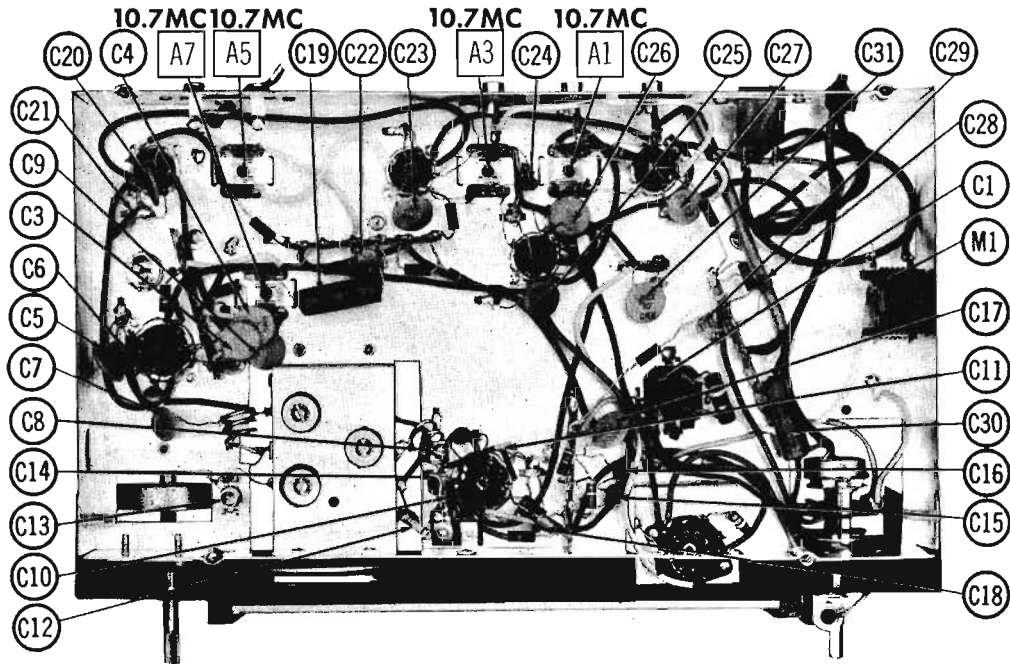
Disconnect line cord antenna.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
3. 270Ω Carbon Resistor	High side thru 270Ω antenna terminal. Low side to chassis.	108MC (Unmod.)	FM	108MC	DC probe thru 1meg res. to point (A) Common to chassis.	A9	Adjust for maximum deflection.
4. "	"	108MC	"	Tune to 108MC signal	"	A10	"
5. "	"	90MC	"	Tune to 90MC signal	"	A11	"





CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



CHASSIS BOTTOM VIEW - ALIGN, CAPACITOR & MISC IDENT

# PARTS LIST AND DESCRIPTIONS

## TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amp. - Mixer	6BU6	
V2	Osc. - AFC	1A7T7	
V3	1st IF Amplifier	6BA6	
V4	2nd IF Amplifier	6AU6	

ITEM No.	USE	TYPE	NOTES
V5	Limiter	6AU6	
V6	Discriminator	6AL5	
V7	Tuning Indicator	EM80/6BR5	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	DEWALD PART No.	AEROVOX PART No.	CORNING DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CLA	40	200	E-212-4	AFB4-02	D0020	FP330	TMQ-3	T-085	R2677*
B	40	200							
C	200	200							

\* Non Catalog Item

## FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	DEWALD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	MALLOY PART No.	SPRAGUE PART No.	
C2	1000			N750-D1 100	DTN-100	C107IU	NT531	5TCU-T1	N750
C3	500			BPD-0045	DD-502	BYA10S1	DC511	5BK-D6	
C4	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C5	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C6	220			BPD-00022	DD-220	L10722	UC-5322	5GA-T22	
C7	100			N750-D1 100	DTN-100	C107IU	NT531	5TCU-T1	N750
C8	2.2			N750-D1 100	DTN-100	CTA6V22C			
C9	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C10	100			N750-D1 100	DTN-100	C107IU	NT531	5TCU-T1	N750
C11	10			N750-D1 10	DTN-10	C10QIU	NT641	5TCU-Q1	N750
C12	68			NPO-S1 68	TCZ-68	CTA6Q68C		6TCC-Q68	NPO
C13									
C14	910					L10791			
C15	470			BPD-00047	DD-471	L10747	UC-5347	5GA-T47	
C16	470			BPD-00047	DD-471	L10747	UC-5347	5GA-T47	
C17	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C18	470			BPD-00047	DD-471	L10747	UC-5347	5GA-T47	
C19	.05	200		P288N-05	DF-503	CUB285	GEM-415	2TM-85	
C20	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C21	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C22	100			N750-D1 100	DTN-100	C107IU	NT531	5TCU-T1	N750
C23	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C24	47			DI 47	DD-470	L10Q47	UC-5447	5GA-Q47	
C25	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C26	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	
C27	100			N750-D1 100	DTN-100	C107IU	NT531	5TCU-T1	N750
C28	470			BPD-00047	DD-471	L10747	UC-5347	5GA-T47	
C29	330			BPD-00033	DD-331	L10733	UC-5333	5GA-T33	
C30	.05	200		P288N-05	DF-503	CUB285	GEM-415	2TM-85	
C31	10000			BPD-01	DD-103	BYA10S1	DC511	5BK-S1	

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		DEWALD PART No.	NOTES	ITEM No.	RATING		DEWALD PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	270K				R10	47K			
R2	220K				R11	1meg			
R3	68K				R12	5900			
R4	2.2meg				R13	2.2meg			
R5	15K				R14	1000Ω			
R6	22K				R15	220K			
R7	10K				R16	1000Ω			
R8	100Ω				R17	100K			
R9	470K				R18	10K			

## RESISTORS (cont)

ITEM No.	RATING		DEWALD PART No.	NOTES	ITEM No.	RATING		DEWALD PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R19	1000Ω				R24	33K			
R20	15K				R25	2.2meg			
R21	100K				R26	390K			
R22	100K				R27	3900	1		
R23	33K				R28	3900	1		

## COILS (RF-IF)

ITEM No.	USE	DEWALD PART No.	REPLACEMENT DATA				NOTES
			Meisner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Trans.	L102B-4					4.7 Microhenries; wound on a 10K Resistor
L2	RF Choke	L104-4					
L3	FM RF Coil	L100-3					2.7 Microhenries
L4	RF Choke	L104-3					
L5	FM Osc. Coil	0-156-5	16-3487	SW-631 *	4906		
L6	1st FM IF	1038B-5	16-3487	FM-254	1463		
L7	2nd FM IF	1038B-5	16-3487	FM-254	1463		
L8	3rd FM IF	1038B-5	16-3487	FM-254	1483		
L9	Discriminator	1038B-2	17-3494	FM-253	1484		

\* Parallel with 10K Resistor.

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	DEWALD PART No.	Haldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	117V ⊕ .28A	130V ⊕ .040A Tap ⊕ 6.3V ⊕ 2.5A		PTL67A	P9102	P3045		PA8421	2BR38	R-30X

## SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	CURRENT (Measured)	DEWALD PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.		
M1	.04A	8018B-3	1234AB	T085	85A 8200 ⊕	⊕ Silicon	

## MISCELLANEOUS

ITEM No.	PART NAME	DEWALD PART No.	NOTES
M2	Dial Lamp		#47
M3	Tuning Cap. Switch	V222B-3 8089-6	2 Gang Selector, 3 Pole, 3 Position Single Wafer, Rotary

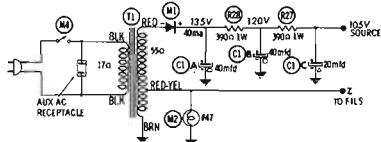
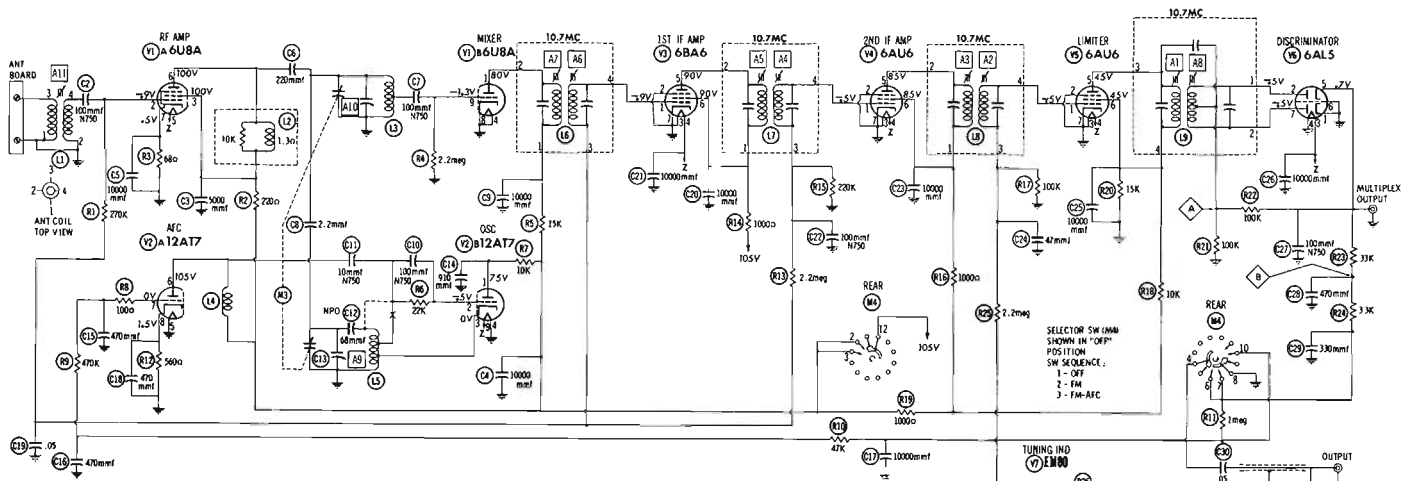
## CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART No.	DESCRIPTION
Knob	K472-7	Tuning Selector
Knob	K472-8	
Dial Scale	DG-807	

## WIRING DATA

General-use Unshielded Hook-up Wire .....	Use BELDEN No. 8530 (Solid) Available in Ten Colors
.....	8524 (Stranded) Available in Ten Colors
Power Cord .....	Use BELDEN No. 1765-B (6 Ft. Length)
.....	1725-K (7½ Ft. Length)



## RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6U8A	1.5K	2.7meg	1000n	0n	.1o	1.000n	66n	0n	2.2meg
V2	12A17	1.1K	22K	0n	0n	0n	1.800n	520K	500n	.1o
V3	6BA6	2.4meg	0n	0n	.1n	1.800n	1.800n	0n		
V4	6AL6	220K	0n	0n	.1o	1.200n	1.200n	0n		
V5	6AU6	100K	0n	0n	.1o	1.900n	1.900n	0n		
V6	6AL5	0n	100K	.1n	0n	200K	0n	100K		
V7	6BR5 12X0	2.3meg	0n	1.800n	0n	.1n	NC	1.30K	NC	1.800n

† MEASURED FROM OUTPUT OF M4  
NC NO CONNECTION

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pins to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±5% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.



**ELECTRO-VOICE  
 MODEL 3304**

TRADE NAME	Electro-Voice Model 3304		
MANUFACTURER	Electro-Voice, Inc., Buchanan, Michigan		
TYPE SET	AC Operated FM-AM Tuner		
TUBES	Sixteen		
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING	.83 Amp. @ 117 Volts AC (90 Watts)
TUNING RANGE--BROADCAST	550KC - 1600KC	FREQ. MOD.	88MC - 108MC

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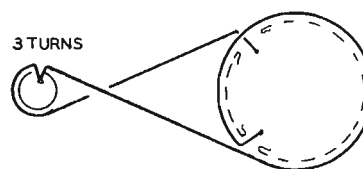
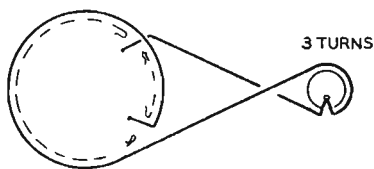
## RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BK7A	† 450Ω	0Ω	820Ω	0Ω	.1Ω	† 1000Ω	1.1Meg	56Ω	0Ω
V2	6U8	† 9400Ω	1.2Meg	† 1200Ω	.1Ω	0Ω	† 1200Ω	0Ω	0Ω	12K
V3	6J6	† 18K	† 18K	0Ω	.1Ω	120Ω	120Ω	470Ω		
V4	6BA6	1.2Meg	0Ω	.1Ω	0Ω	† 700Ω	† 18K	68Ω		
V5	6BA6	1.5Meg	0Ω	.1Ω	0Ω	† 450Ω	† 18K	68Ω		
V6	6AU6	100K	0Ω	.1Ω	0Ω	† 12K	† 20K	0Ω		
V7	6AU6	27K	0Ω	.1Ω	0Ω	† 12K	† 16K	0Ω		
V8	6AL5	0Ω	120K	0Ω	.1Ω	240K	0Ω	120K		
V9	12A7	† 470K	1.2Meg	0Ω	.1Ω	.1Ω	† 22K	† 1Meg	7000Ω	0Ω
V10	6AL7	3300Ω	.1Ω	† 0Ω	0Ω	330K	1.1Meg	0Ω	3300Ω	
V11	6BA6	1.7Meg	0Ω	0Ω	.1Ω	† 250Ω	† 18K	68Ω		
V12	6BE6	22K	.1Ω	0Ω	.1Ω	† 170Ω	† 7800Ω	1.6Meg		
V13	6AU6	2Meg	0Ω	0Ω	.1Ω	† 1500Ω	† 20K	68Ω		
V14	12A7	† 470K	1.8Meg	0Ω	0Ω	0Ω	† 24K	1Meg	8200Ω	.1Ω
V15	12AX7	† 180K	85Ω	2700Ω	0Ω	0Ω	† 180K	270K	2700Ω	.1Ω
V16	5Y3GT	NC	20K(MIN)	NC	41Ω	NC	39Ω	NC	20K(MIN)	

† MEASURED FROM PIN 8 OF V 16  
NC NO CONNECTION

FM

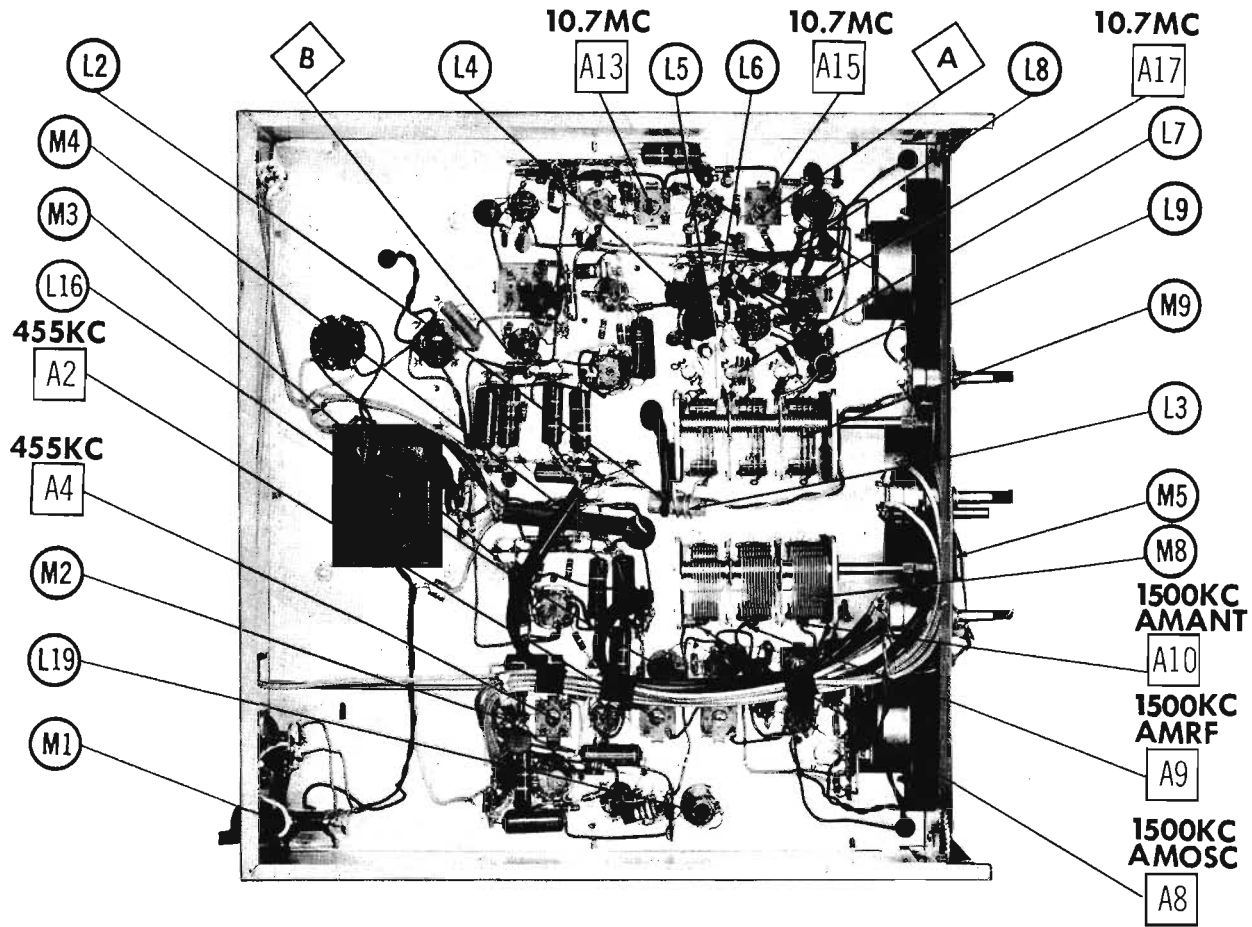
AM



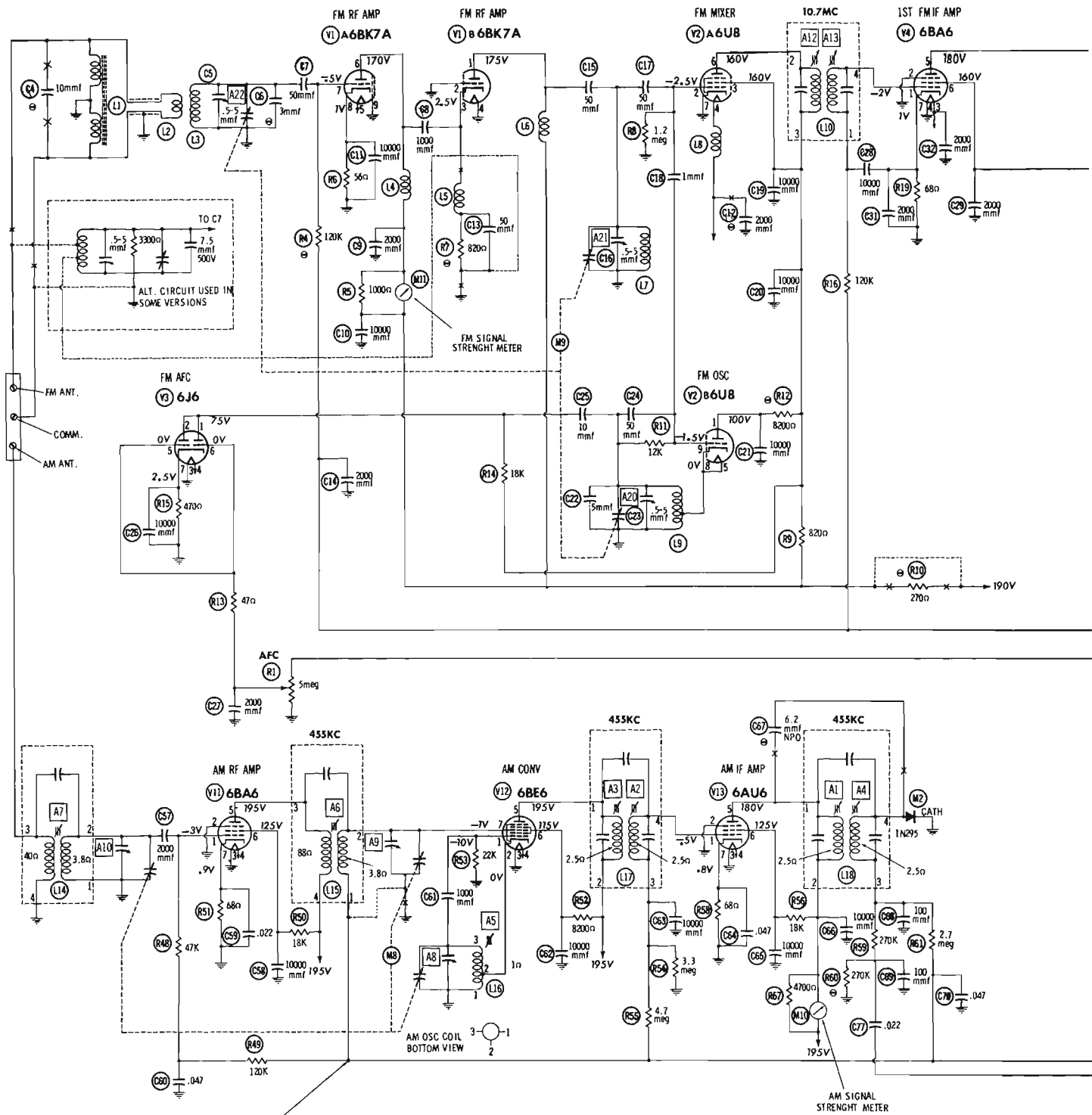
TUNING GANG FULLY CLOSED

TUNING GANG FULLY CLOSED

## DIAL CORD STRINGING



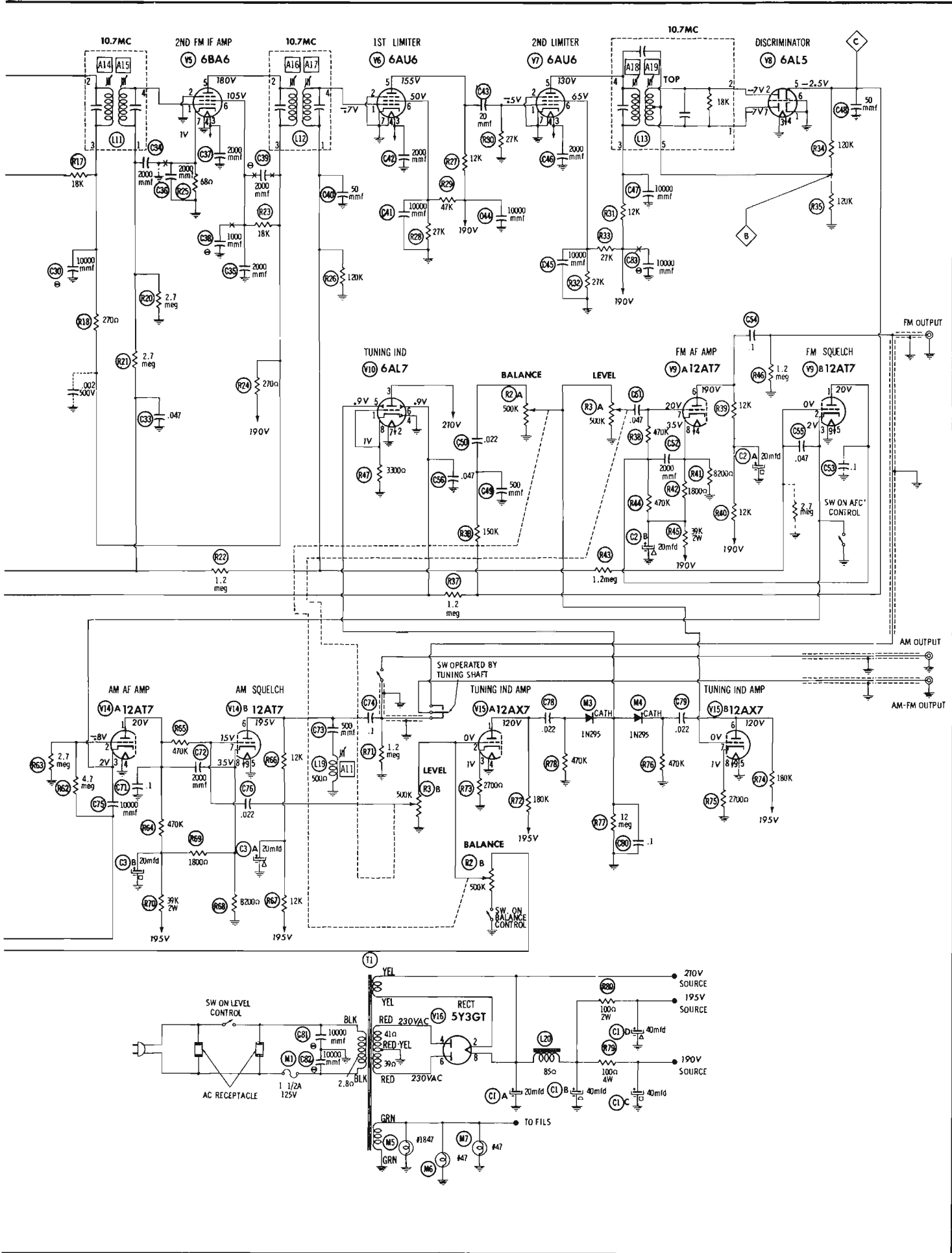
CHASSIS BOTTOM VIEW-INDUCTOR AND ALIGNMENT IDENTIFICATION



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC



# ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT							
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.							
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.							
AM ALIGNMENT							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1. .01MFD	High side to pin 7 (grid) of 6BE6 (V12). Low side to chassis.	455KC (400% Mod)	AM	Point of non-interference	DC probe to point (A). Common to chassis.	A1, A2, A3	Insert 10K shunt across A4. Adjust A1, A2, A3 for maximum deflection.
2. "	"	"	"	"	"	A4	Remove shunt from A4 and insert across A1. Adjust A4 for maximum deflection. Remove 10K shunt.
3. 250Ω Carbon Resistor	Thru dummy to AM Antenna terminal. Low side to "C" terminal.	600KC	"	600KC	"	A5, A6, A7	Adjust for maximum deflection.
4. "	"	1500KC	"	1500KC	"	A8, A9, A10	Adjust for maximum deflection. Repeat steps 3 & 4 until signal generator frequency and dial coincide.
WHISTLE FILTER ADJUSTMENT							
5. .01MFD	High side to pin 7 (grid) of 12AT7 (V14). Low side to chassis.	10KC	"	Point of non-interference	AC VTVM across AM Output Jack	All	Squelch Switch off. Adjust for MINIMUM deflection.
FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6. .01MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (Unmod)	FM (Squelch off)	Point of non-interference	DC probe to point (B). Common to chassis.	A12, A13, A14, A15, A16, A17, A18	Adjust for maximum deflection.
7. "	"	"	"	"	DC probe to point (C). Common to chassis.	A19	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6. .01MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (300KC Swp)	FM (Squelch off)	Point of non-interference	Vert. Amp. thru 1Meg to point (B). Low side to chassis.	A12, A13, A14, A16, A17, A18	Short AVC Line to chassis. Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7. "	"	"	"	"	Vert. Amp. thru 1Meg to point (C). Low side to chassis.	A19	Remove short from AVC Line. Adjust so that 10.7MC occurs at center of cross-crossover lines similar to Fig. 2. SLIGHTLY retouch A18 for maximum amplitude and straightness of crossover lines.
FM RF ALIGNMENT							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
8. 270Ω Carbon Resistor	High side thru 270Ω to FM Antenna terminal. Low side to "C" terminal.	88MC	FM (AFC fully on)	88MC	DC probe to point (D). Common to chassis.	L9, L8, L7	Adjust for maximum deflection by expanding or compressing coil turns.
9. "	"	106MC	FM (Squelch off)	106MC	"	A20, A21, A22	Adjust for maximum deflection.

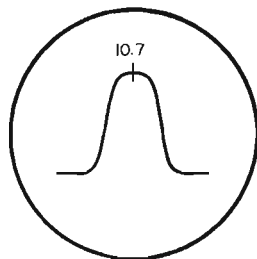


FIG. 1

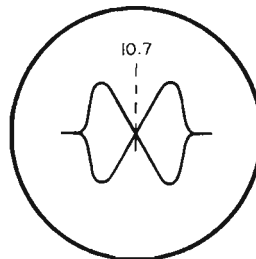
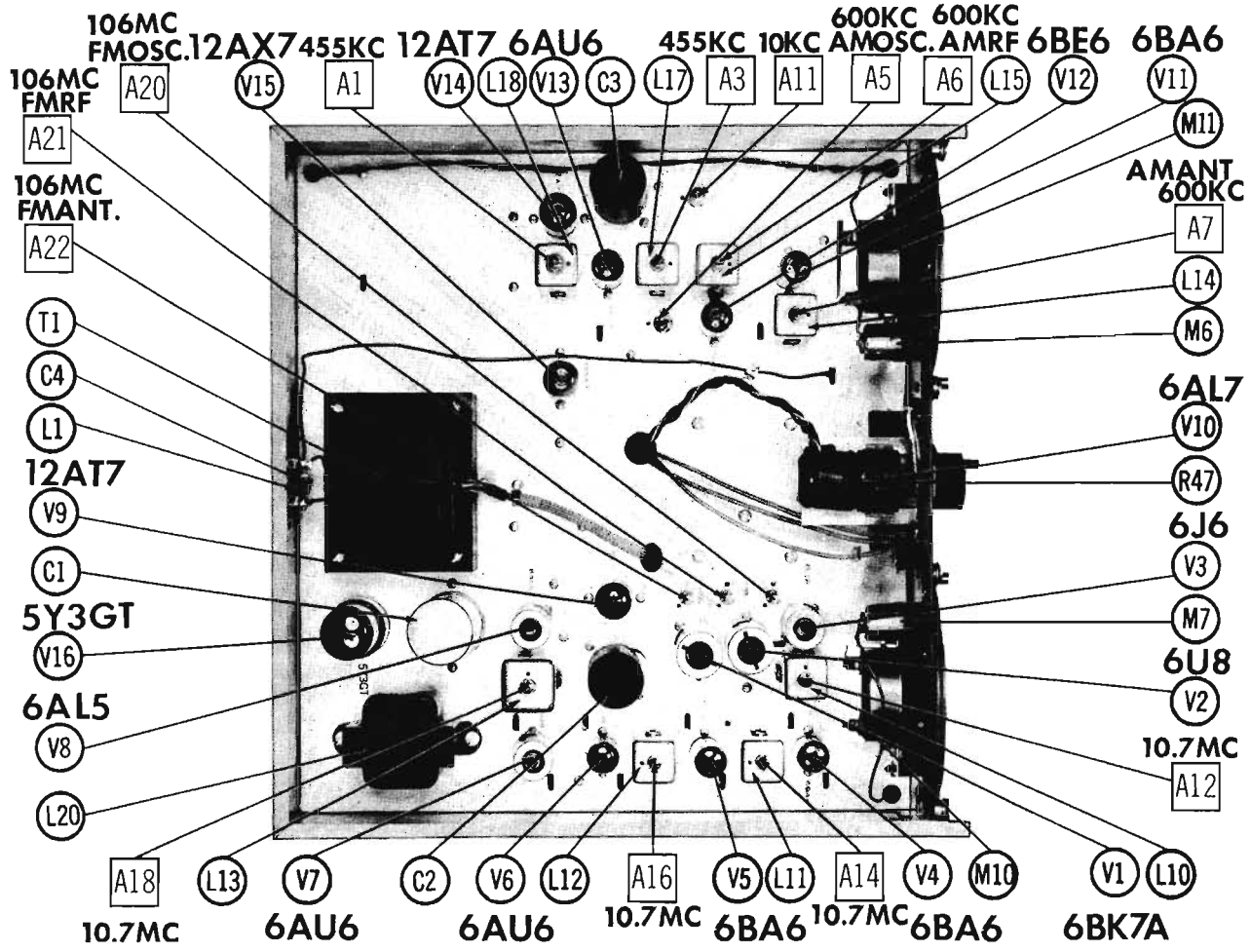
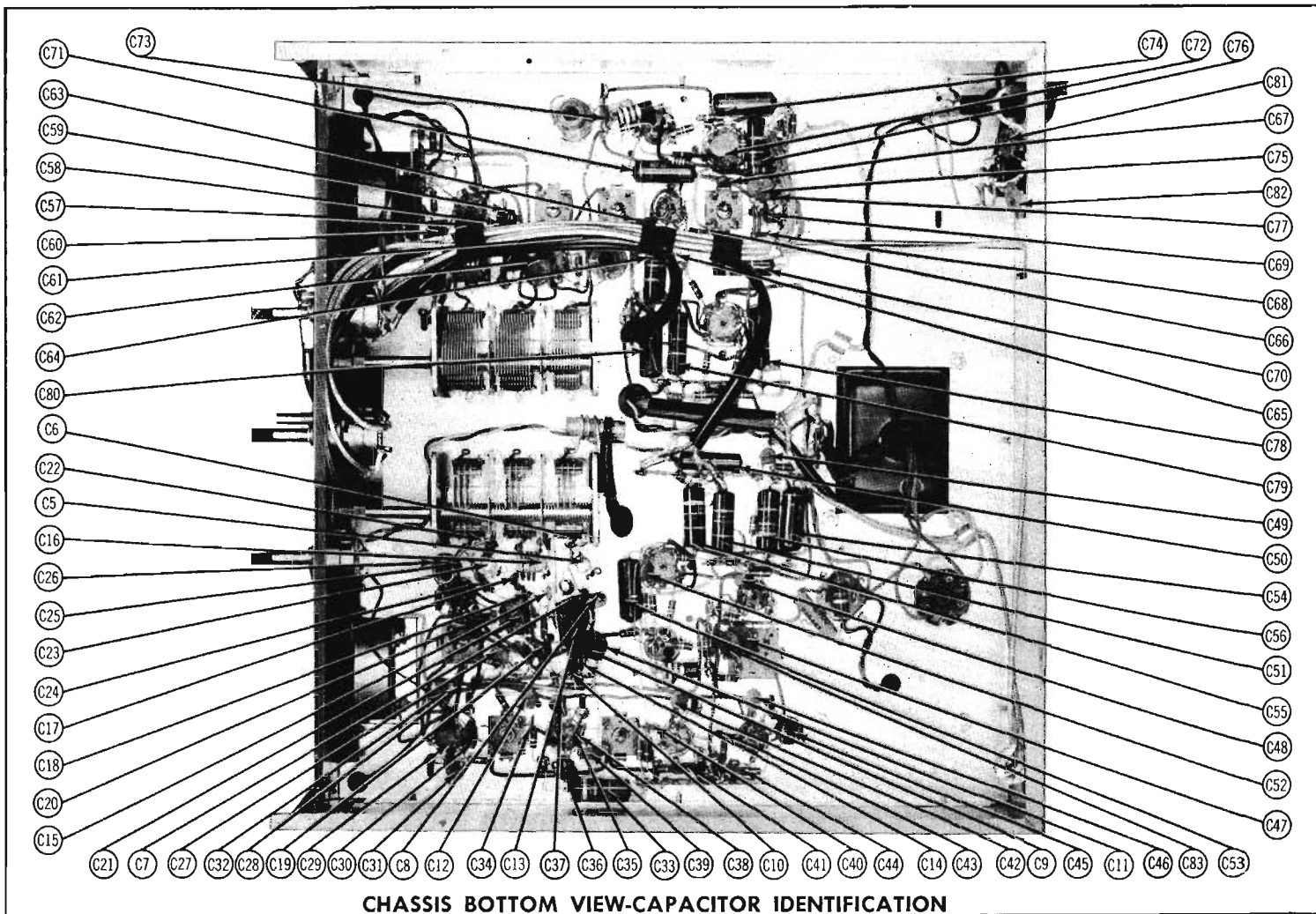
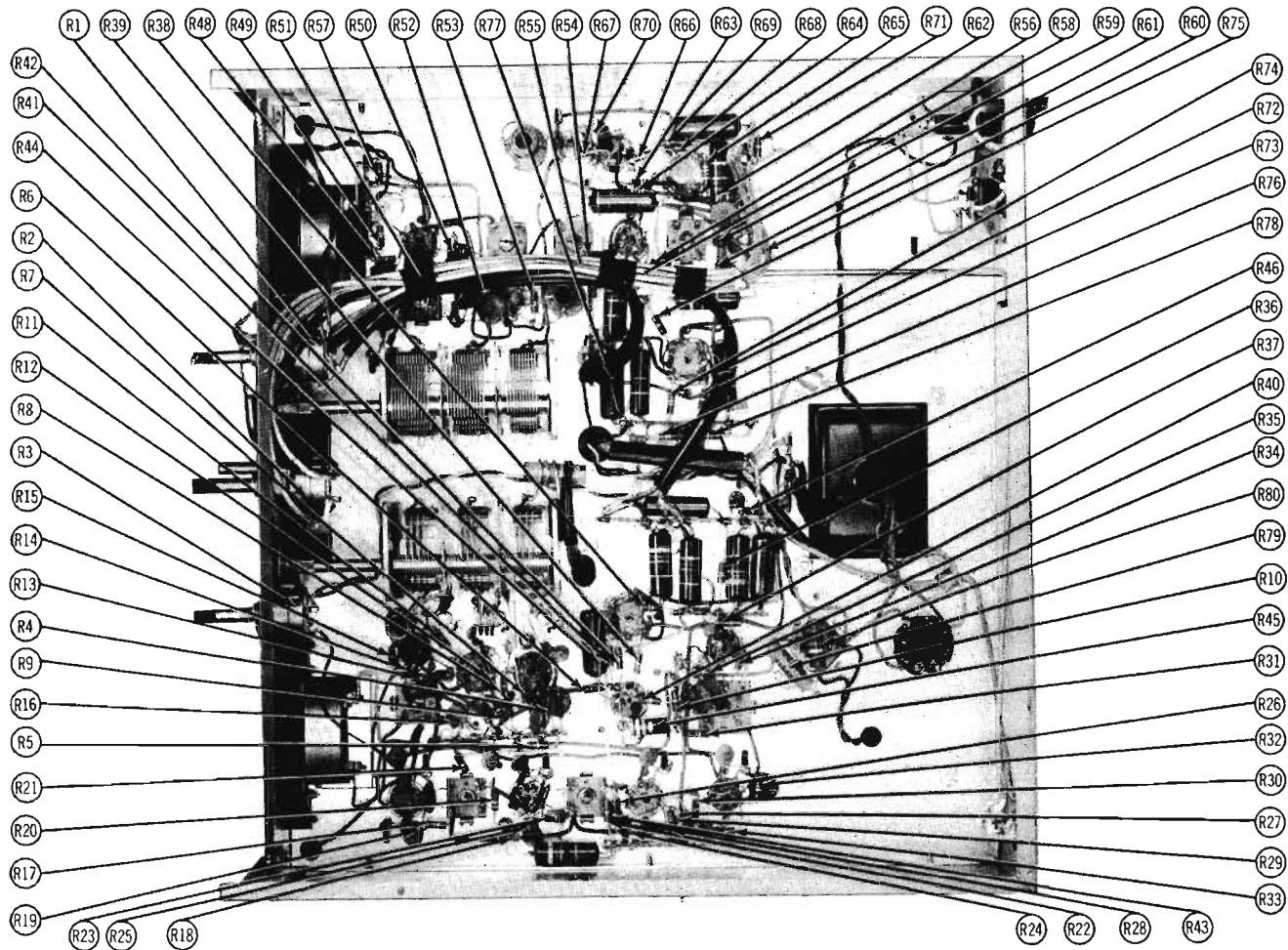


FIG. 2



CHASSIS TOP VIEW





**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**



**PARTS LIST AND DESCRIPTIONS**  
**TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6BK7A		V9	FM AF Amp-FM Squelch	12AT7	
V2	FM Mixer FM Osc.	6U8		V10	Tuning Indicator	6AL7	
V3	FM AFC	6U5		V11	AM RF Amplifier	6BA6	
V4	1st. FM IF Amplifier	6BA6		V12	AM Converter	8BE6	
V5	2nd. FM IF Amplifier	6BA6		V13	AM IF Amplifier	6AU6	
V6	1st. Limiter	6AU6		V14	AM AF Amp.-AM Squelch	12AT7	
V7	2nd. Limiter	6AU6		V15	Tuning Indicator Amp.	12AX7	
V8	Discriminator	6AL5		V16	Rectifier	5Y3GT	

**ELECTROLYTIC CAPACITORS**

RATING		REPLACEMENT DATA							
ITEM No.	CAP.	VOLT.	Electro-Voice PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	20	350	4299		DD032	FP376, 9		Q-012	R2287*
B	40	350			BR4035	TC-60		MT-4520	
C	40	350							
D	40	350							
C2A	20	350	42010	AFH2-37	B0300	FP227	TMD-35	D-160	TVL-2755
B	20	350							
C3A	20	350	42010	AFH2-37	B0300	FP227	TMD-35	D-160	TVL-2755
B	20	350							

\* Non Catalog Item

**FIXED CAPACITORS**

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

RATING		REPLACEMENT DATA									NOTES
ITEM No.	CAP.	VOLT.	Electro-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C4	10		42009	S110	D6-100	L10Q1	GP-10	UC-541	5GA-Q1	1	
C5	.5-5										
C6	3									2	
C7	50		42005	BPD-0005	DD-500	C10V3C L10Q5	TCT-1 L10Q5	ED-50 UC-545	5GA-Q5		
C8	1000		4258	BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1		
C9	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C10	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C11	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C12	20000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2	1	
C13	50		42005	BPD-0005	DD-500	L10Q5	ED-50	UC-545	5GA-Q5		
C14	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C15	50		42005	BPD-0005	DD-500	L10Q5	ED-50	UC-545	5GA-Q5		
C16	.5-5		42009				532-A				
C17	50		42005	BPD-0005	DD-500	L10Q5	ED-50	UC-545	5GA-Q5		
C18	1.0		42006	NPO-S11, 0	TCX-1		TCO-1		5TCXB-V1		
C19	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C20	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C21	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C22	5		42007	S15	D6-050	L10Q5	ED-5	ZT-855	5GA-V5		
C23	.5-5		42009				532-A				
C24	50		42005	BPD-0005	DD-500	L10Q5	ED-50	UC-545	5GA-Q5		
C25	10		4212	SI10	D6-100	L10Q5	GP-10	UC-541	5GA-Q1		
C26	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C27	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C28	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C29	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C30	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C31	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C32	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C33	.047	400	4243	P488N-047	DF-503	CUB4847		GEM-4147	4TM-S47		
C34	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C35	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C36	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C37	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C38	1000		4258	BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	1	
C39	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C40	50		42005	BPD-0005	DD-500	L10Q5	ED-50	UC-545	5GA-Q5		
C41	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C42	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		

**PARTS LIST AND DESCRIPTIONS (Continued)**  
**RESISTORS**

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Electro-Voice PART No.	NOTES	ITEM No.	RATING		Electro-Voice PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R4	120K		4670	Note 1	R43	1.2Meg		4656	Note 5
R5	1000Ω		4653		R44	470K		4650	
R6	50Ω		4622	R45	39K	2	4682		
R7	820Ω		4694	R46	1.2Meg		4656		
R8	1.2Meg		4656	R47	3300Ω		46017		
R9	820Ω		4694	R48	47K		4656		
R10	270Ω		48034	R49	120K		4670		
R11	12K		-649	R50	18K		46029		
R12	8200Ω		46031	R51	88Ω		4631		
R13	47Ω		-6035	R52	8200Ω		46001		
R14	18K		36029	R53	22K		4676		
R15	470Ω		4654	R54	3.3Meg		46033		
R16	120K		4670	R55	4.7Meg		46026		
R17	18K		46029	R56	18K		46029		
R18	270Ω		46034	R57	4700Ω		4675		
R19	68Ω		4631	R58	68Ω		4631		
R20	2.7Meg		46030	R59	270K		4669		
R21	2.7Meg		46030	R60	270K		4669		
R22	1.2Meg		4656	R61	2.7Meg		46030		
R23	18K		46029	R62	4.7Meg		46026		
R24	270Ω		46034	R63	2.7Meg		46030		
R25	68Ω		4631	R64	470K		4650		
R26	120K		4670	R65	470K		4650		
R27	12K		4649	R66	12K		4649		
R28	27K		4651	R67	12K		4649		
R29	47K		4668	R68	8200Ω		46031		
R30	27K		4651	R69	1800Ω		4677		
R31	12K		4649	R70	39K	2	4682		
R32	27K		4651	R71	1.2Meg		4656		
R33	27K		4651	R72	180K		4671		
R34	120K		4670	R73	2700Ω		46036		
R35	120K		4670	R74	180K		4671		
R36	150K		4603	R75	2700Ω		46036		
R37	1.2Meg		4656	R76	470K		4650		
R38	470K		4650	R77	12Meg		4672		
R39	12K		4649	R78	470K		4650		
R40	12K		4649	R79	100Ω	4	4684		
R41	8200Ω		46031	R80	100Ω	2	4655		
R42	1800Ω		4677						

Note 1. Some versions may use 1.2Meg in this application (Part#4656)

Note 2. Some versions may use 270Ω in this application (Part#46034)

Note 3. Not used in some versions

Note 4. Some versions may use 4700Ω in this application (Part#4675)

Note 5. Some versions may use 82K in this application (Part#4696)

**TRANSFORMER (POWER)**

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Electro-Voice PART No.	Haldorson PART No.	Merit PART No.	Shonor PART No.	Thordarson PART No.	Tried PART No.
T1	117VAC	480VCT	5V	6.3V	1598					
	② 83A	② 140A	② 2A	② 4.8A						

## PARTS LIST AND DESCRIPTIONS (Continued)

### CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT	Electro-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIC PART No.	MALLOYRY PART No.	SPRAGUE PART No.		
C43	20		42004	BPD-0002	DD-200	L10Q2	ED-20	UC-542	5GA-Q2		
C44	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C45	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C46	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C47	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C48	50		42005	BPD-00005	DD-500	L17Q5	GP-50	UC-545	5GA-Q5		
C49	500		42003	DDP-0005	DD-501	L10T5	ED-500	UC-535	5GA-T5		
C50	.022	400	4260	P488N-022	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22		
C51	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C52	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C53	.1	200	4265	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1		
C54	.1	200	4265	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1		
C55	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C56	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C57	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C58	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C59	.022	200	4260	P288N-022	DD-203	CUB4S22	ED-02	GEM-4122	2TM-S22		
C60	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C61	1000		4258	BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1		
C62	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C63	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C64	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C65	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C66	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C67	6.2										
C68	100		4161	BPD-0001	DD-101	L10T1	ED-100	UC-531	5GA-T1	①) NPO	
C69	100		4261	BPD-0001	DD-101	L10T1	ED-100	UC-531	5GA-T1		
C70	.047	400	4243	P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C71	.1	200	4265	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C72	2000		4259	BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C73	500		42003	BPD-0005	DD-501	L10T5	ED-500	UC-535	5GA-T5		
C74	.1	200	4265	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1		
C75	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C76	.022	400	4260	P488N-022	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22		
C77	.022	400	4260	P488N-022	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22		
C78	.022	400	4260	P488N-022	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22		
C79	.022	400	4260	P488N-022	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22		
C80	.1	200	4265	P288N-1	DF-104	CUB2P1		GEM-201	2TM-P1		
C81	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	③	
C82	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	④	
C83	10000		4252	BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1	⑤	

- ① Not used in some versions  
 ② Some versions may use 7.5 MFD in this application (Part # 42009)  
 ③ Some version may use 2000 MFD in this application (Part # 4259)  
 ④ Some version may use .047 MFD in this application (Part # 4243)

## CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Electro-Voice PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLOYRY PART No.	
RLA	5Meg	1/2	U4686	B-87	A47-5Meg-S	Q11-141	U-87	AFc
B	5Meg	1/2		Not Reg.	FS-3	Not Reg.	US-26	Squelch
C	Switch	1/2		KB-1	SWE-12	Q11-133	UE1404S	Balance
R2A	500K	1/2	Y4686			Q11-133	Not Reg.	Balance
B	500K	1/2				Q11-133	Not Reg.	AM Output
C	Switch	1/2				76-2	Not Reg.	Level
R3A	500K	1/2	X4686		AD47-500K-Z		UE1403S	Level
B	500K	1/2					Not Reg.	Level
C	Shaft	1/2					Not Reg.	Power On-Off
D	Switch	1/2					Not Reg.	

## PARTS LIST AND DESCRIPTIONS (Continued)

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		Electro-Voice PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	FM Ant. Trans.					
L2	Fm Coupling Coil					
L3	Fm Ant. Coil					
L4	RF Choke	19-1001		BC-562	4604	1.7 Microhenries
L5	RF Choke	19-1001		BC-562	4604	1.7 Microhenries
L6	RF Choke	19-1001		BC-562	4604	1.7 Microhenries
L7	Fm RF Coil	3590				
L8	Fil. Choke					
L9	FM Osc. Coil	3589				
L10	1st FM IF	15008	16-347L <sub>a</sub>	FM-254*	1463*	
L11	2nd FM IF	15004	16-347L <sub>a</sub>	FM-254*	1463*	
L12	3rd FM IF	15004	16-347L <sub>a</sub>	FM-254*	1463*	
L13	FM Discriminator	15002		FM-250 <sub>a</sub>	1452*	
L14	AM Ant. Trans.	15006				
L15	AM RF Trans.	15007				
L16	AM Osc. Coil	15009				70-08c
L17	1st AM IF	15003				
L18	2nd AM IF	15005				
L19	10KC Filter	15010				

- ▲ Drill 2 Mounting Holes  
 ▲ Use Adapter Plate  
 ● Disregard Primary. Drill New Mounting Hole  
 ▲ Parallel With 18K Resistor

## FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (D. CURRENT 1000 $\mu$ )	Electro-Voice PART No.	Holderson PART No.	Merit PART No.	Sonoron PART No.	Thordarson PART No.	Triad PART No.
L20	.130A	85 $\Omega$	3HY	1599	C5025	C-2974	C-2303		C-13X ①

- ① Drill New Mounting Hole

## FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Electro-Voice PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	1 1/2A 125V (Slo-Blo)	20171		31301-5	342001	MDL 1 1/2	HKP

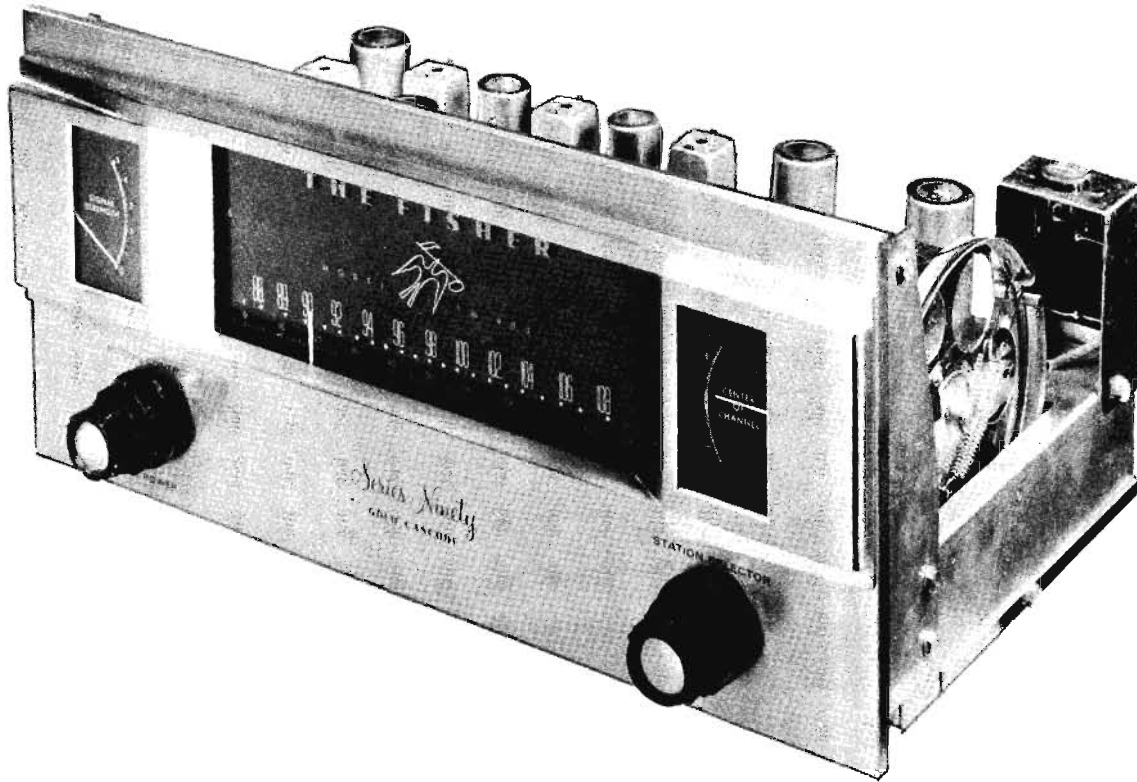
## CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		Electro-Voice PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N294	4346	1N54A	1N33A	AM Detector
M3	1N294	4346	1N54A	1N34A	Tuning Indicator Rectifier
M4	1N294	4346	1N54A	1N34A	Tuning Indicator Rectifier

## MISCELLANEOUS

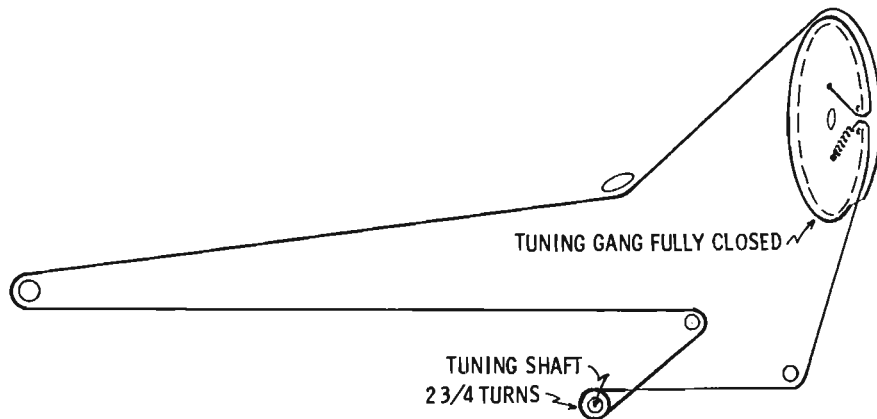
ITEM No.	PART NAME	Electro-Voice PART No.	NOTES
M5	Pilot Lamp		#1841
M6	Dial Lamp		FM, #47
M7	Dial Lamp		AM, #47
M8	AM Tuning Cap.	42012	3 Gang (Ant. 15-400MMF, RF 15-400MMF, Osc. 35-200MMF)
M9	Fm Tuning Cap.	42011	3 Gang
M10	Meter		AM Signal Strength,
M11	Meter		FM Signal Strength.





TRADE NAME	Fisher Model FM-90X		
MANUFACTURER	Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N. Y.		
TYPE SET	AC Operated FM Tuner		
TUBES (Nine)	Types V50064, RF Amplifier, 6BK7A Mixer-Osc., 6BH6 1st IF Amplifier, 6BH6 2nd IF Amplifier, 6AM8 3rd IF Amp-Squelch Diode, 12AX7 Squelch Amp.-AF Amp., 6BH6 Limiter, 12AU7 AF Amp.-Meter Amp., 6X4 Rectifier		
POWER SUPPLY	105-125 Volts AC - 50/60 Cycles	RATING	.46 Amp. @ 117 Volts AC (46 Watts)
TUNING RANGE-FREQ.MOD.	88 - 108MC		

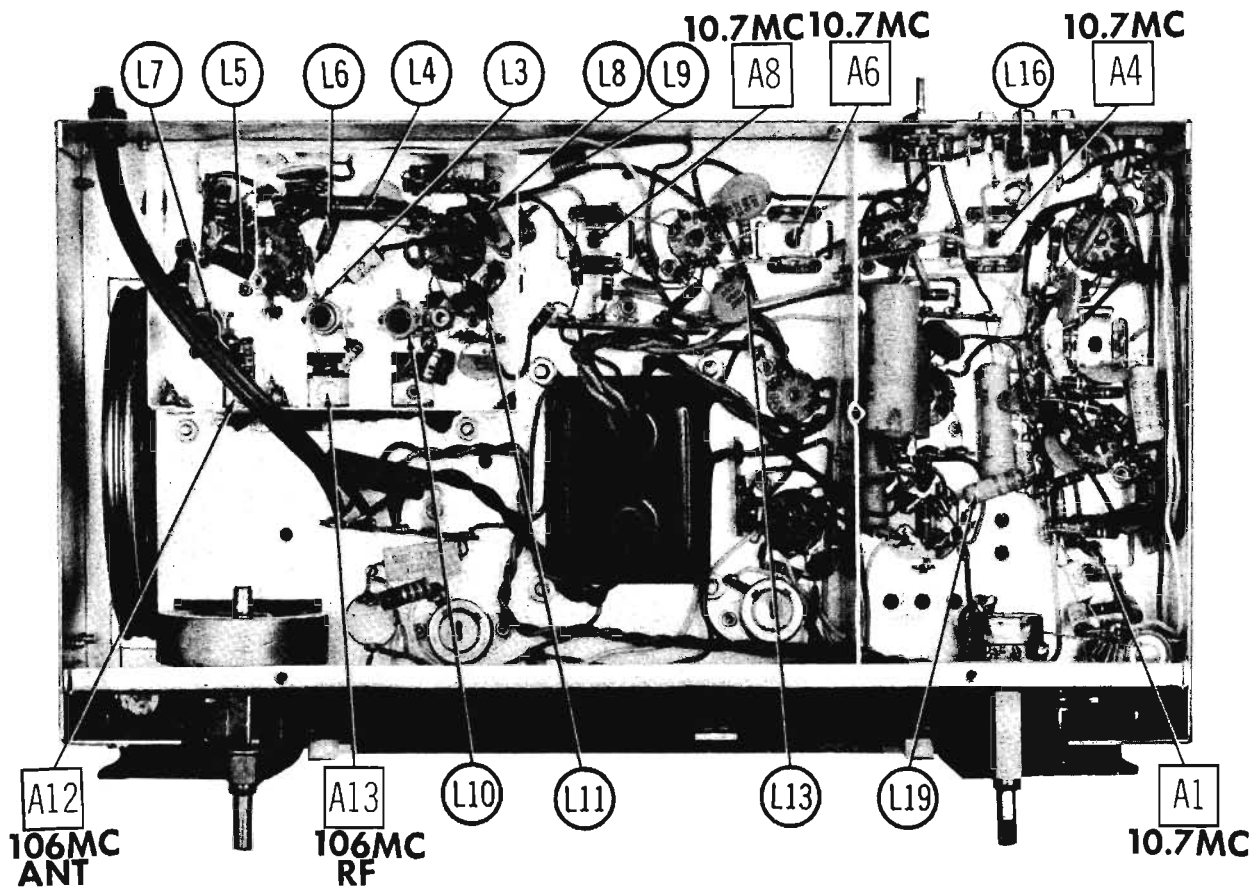
**FISHER  
 MODEL FM-90X**



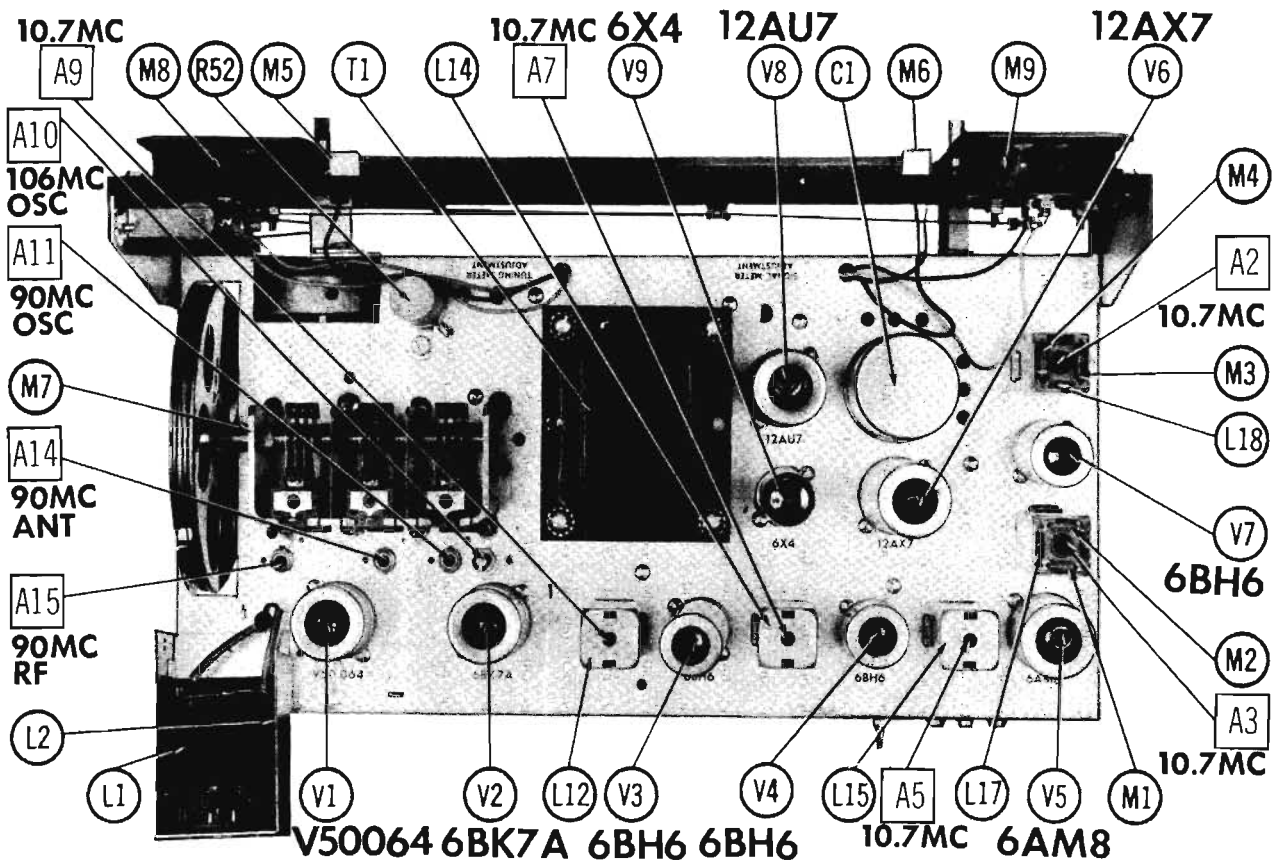
**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H382

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CHASSIS BOTTOM VIEW- INDUCTOR AND ALIGNMENT IDENTIFICATION



CHASSIS TOP VIEW

# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.  
Set muting control to **MINIMUM**.  
With tuning capacitor fully closed, set dial pointer to zero mark on logging scale.

### IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01mfd	High side to pin 1 (grid) of 6BH6 (V7). Low side to chassis.	10.7MC (Unmod)	Point of non-interference	DC probe to point (A). Common to chassis.	A1	Adjust for maximum deflection.
2. "	"	"	"	DC probe to point (B). Common to chassis.	A2	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
3.	High side to ungrounded tube shield on 6BK7A (V2). Low side to chassis.	"	"	DC probe to point (C). Common to chassis.	A3, A4, A5, A6, A7, A8, A9	Adjust for maximum deflection.

### IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1. .01mfd	High side to pin 1 (grid) of 6BH6 (V7). Low side to chassis.	10.7MC (450KC Swp)	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A1	Disconnect stabilizing capacitor (C2). Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2. "	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A2	Reconnect C2. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A1 for maximum amplitude and straightness of crossover lines.
3.	High side to ungrounded shield (V2). Low side to chassis.	"	"	Vert. Amp. to point (C). Low side to chassis.	A3, A4, A5, A6, A7, A8, A9	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.

### RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4. Two 120Ω Carbon Resistors	To antenna leads with 120Ω in each side.	106MC (Unmod)	106MC	DC probe to point (C). Common to chassis.	A10	Adjust for maximum deflection.
5. "	"	90MC	90MC	"	A11	"
6. "	"	106MC	106MC	"	A12, A13	"
7. "	"	90MC	90MC	"	A14, A15	Adjust for maximum deflection. Repeat steps 4 thru 7.

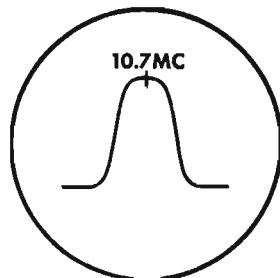


FIG. 1

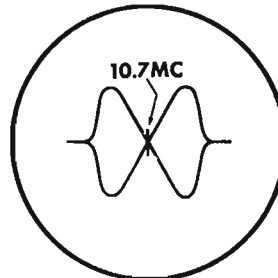
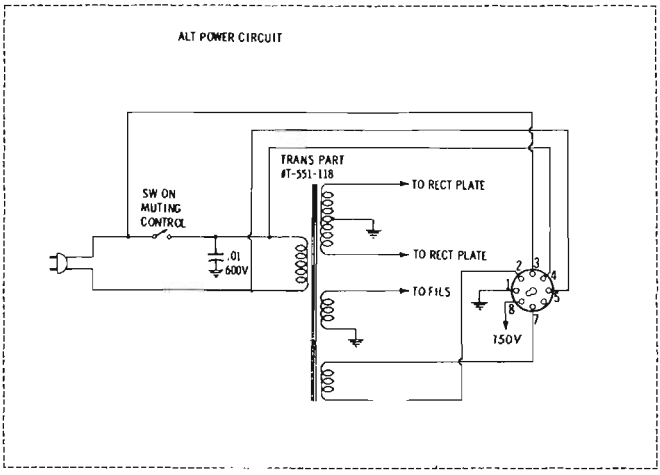
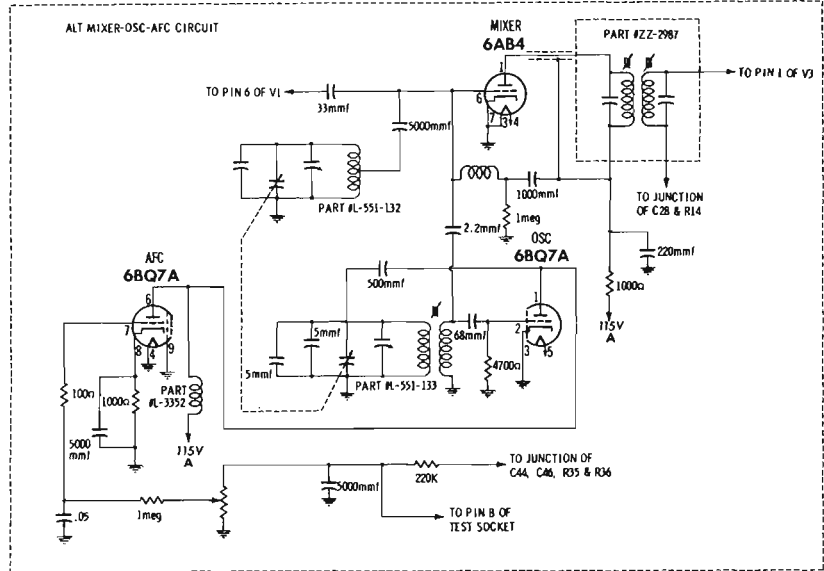
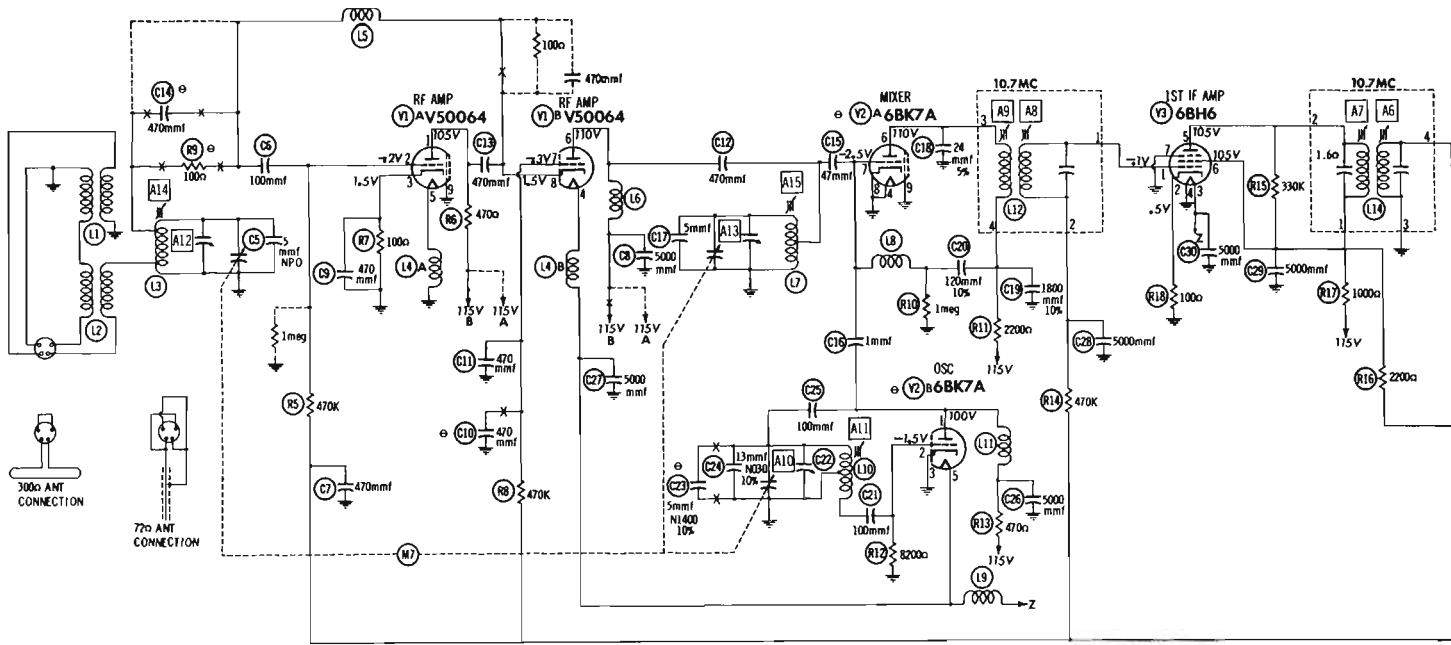
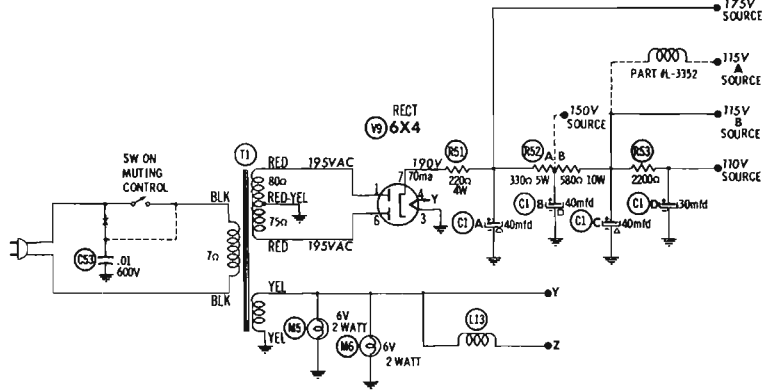
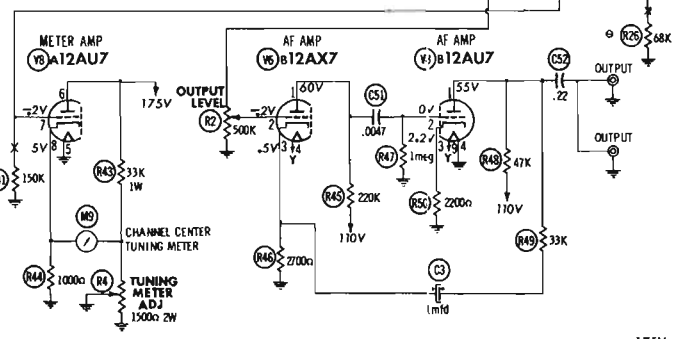
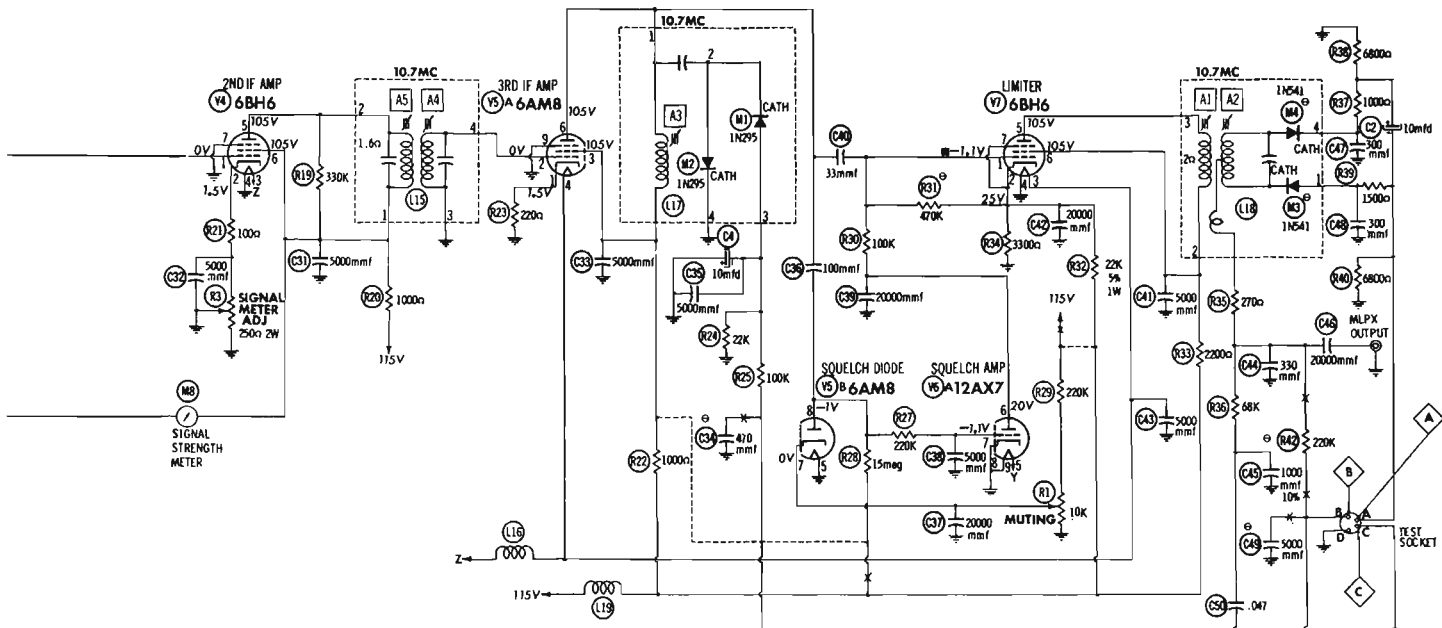


FIG. 2



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

⊙ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION  
 DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

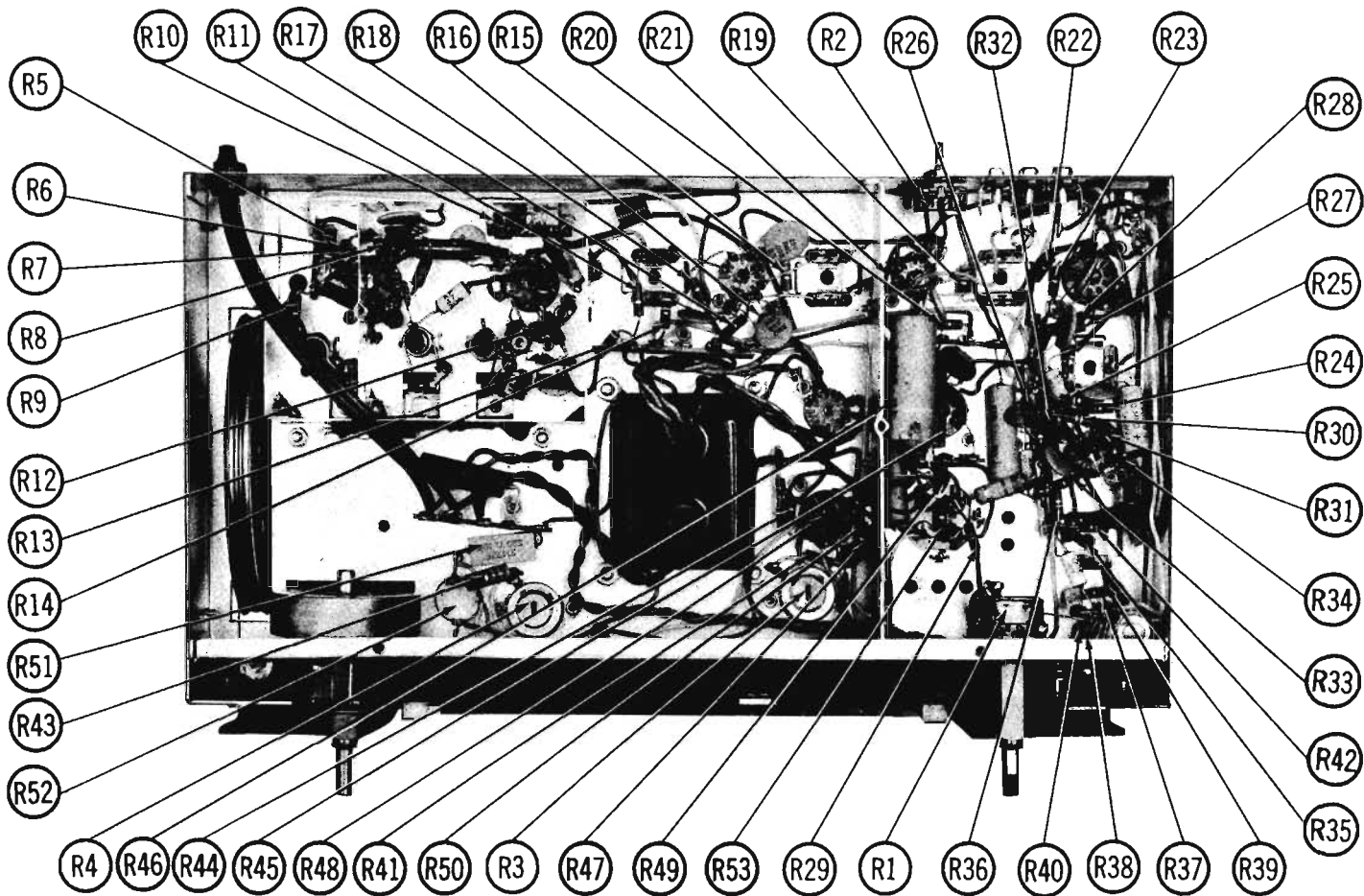


RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BK7A	1700Ω	530K	100Ω	.1Ω	.1Ω	1200Ω	530K	100Ω	0Ω
V2	6BK7A	1700Ω	8200Ω	0Ω	.1Ω	.1Ω	13300Ω	1meg	0Ω	0Ω
V3	6BH6	530K	100Ω	.1Ω	0Ω	12100Ω	12100Ω	0Ω		
V4	6BH6	.4Ω	370Ω	.1Ω	0Ω	12100Ω	12100Ω	0Ω		
V5	6AM8	220Ω	.4Ω	12100Ω	.1Ω	0Ω	12100Ω	0Ω	15meg	0Ω
V6	12AX7	1220K	240K	2700Ω	.1Ω	.1Ω	570K	15meg	0Ω	0Ω
V7	6BH6	470K	3300Ω	.1Ω	0Ω	13300Ω	13300Ω	3300Ω		
V8	12AU7	151K	1meg	2200Ω	0Ω	0Ω	1220Ω	90K	600Ω	.1Ω
V9	6X4	80Ω	NC	0Ω	.1Ω	NC	75Ω	20K(Min)		

† MEASURED FROM PIN 7 OF V9  
 # MEASURED FROM PIN 2 OF V7  
 NC NO CONNECTION





CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

## PARTS LIST AND DESCRIPTIONS

### TUBES ( GENERAL ELECTRIC, SYLVANIA )

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	V50084		V6	Squelch Amp.-AF Amp.	12AX7	
V2	Mixer-Oscillator	6BK7A	Note 1	V7	Limiter	6BB8	
V3	1st IF Amplifier	6BB8		V8	AF Amp. - Meter Amp.	12AU7	
V4	2nd IF Amplifier	6BB8		V9	Rectifier	6X4	
V5	3rd IF Amp.-Squelch Diode	6AM8					

Note 1. In some versions, the mixer is a 6AB4. A 6BQ7A is used for the oscillator-AFC tube.

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	FISHER PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	250	C590-130	AFB4-04-50	D0034	FP420.38	TMQ-120	Q-012	TVL-4635.3
B	40	200							
C	40	200							
D	30	250							
C2	10	50	C551-128	PRS50V10	BBR10-50	TC32	TD-10-50	MT-0510	TVA-1304
C3	1	250	CS46-126	PRS450V1	BR145	TT250X1	ML10-50	MMT-4501	R2622 *
C4	10	50	C551-146	PWE50010	NL10-50	TT50X10		MMT-0510	TE-1304

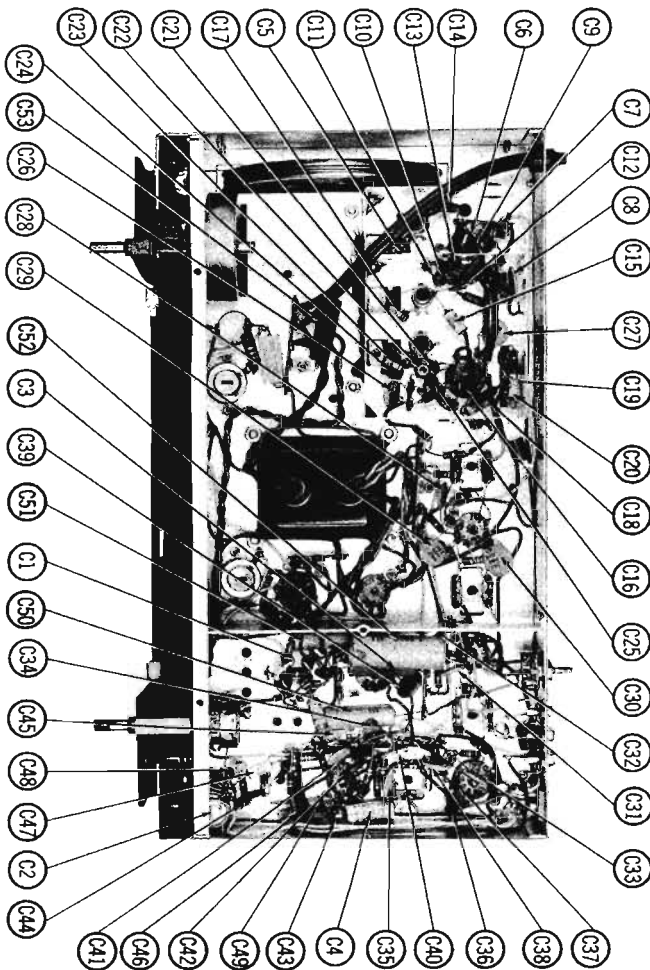
\* Non Catalog Item

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	FISHER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	5	500	CC20C8050F5	NPO-81 5	TCZ-4R7	CTA8V47C	ZT-555	5TCCB-V47	NPO
C6	100	600	C-577-121	BPD-0001	DD-101	LI0T1	UC-531	5GA-T1	
C7	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	
C8	5000	600	CK82G P502V6	BPD-005	DD-602	BYA10D5	DC525	5HK-D6	
C9	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	①
C10	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	
C11	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	
C12	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	
C13	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	
C14	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	①
C15	47	500	CC21G P470M5	81 47	D8-470	LI0Q47	UC-5447	5GA-Q47	
C16	5	500	RF-781	NPO-81 1	TCZ-4	CTC8-V1	ZT-555	5TCCB-V1	NPO
C17	5	500	CC20C8050F5	NPO-81 5	TCZ-4R7	CTA8V47C	ZT-555	5TCCB-V47	NPO
C18	24	600	CC21G P24025		TCZ-24				5% 10%
C19	1800	500	CC280 P182K5						10%
C20	120	500	CC21G P121K5	NPO-81 120	D6-121	CTA8T12C	UC-531	5TCC-T12	10%
C21	100	600	C-577-121	BPD-0001	DD-101	LI0T1		5GA-T1	10%
C22	5	600	CC20VK050F5						N1400 10%
C24	13	500	CC20BG130K5						N030 10%
C25	100	600	C-577-121	BPD-0001	DD-101	LI0T1	UC-531	5GA-T1	
C26	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C27	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C28	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C29	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C30	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C31	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C32	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C33	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C34	470	500	C-520-143	BPD-00047	DD-47L	LI0T47	UC-5347	5GA-T47	①
C35	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C36	100	600	C-577-121	BPD-0001	DD-101	LI0T1	UC-531	5GA-T1	
C37	20000	600	C-556-122	BPD-02	DD-203	BYA10S2	UC-531	5HK-D2	
C38	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C39	5000	600	C-556-122	BPD-02	DD-203	BYA10S2	DC525	5HK-D5	
C40	33	500	CC21G P330M5	81 33	D6-330	LTQ33	UC-5433	5GA-Q33	
C41	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C42	20000	600	C-556-122	BPD-02	DD-203	BYA10S2	DC525	5HK-D2	
C43	5000	600	CK82G P502V6	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C44	500	500	CC18G P101K4	81 300	D6-301	LT073	UC-533	5GA-T3	
C46	20000	600	CC18G P102K6	BPD-02	DD-203	BYA10S2			10%

## CHASSIS BOTTOM VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

## CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	FISHER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	SPRACUE PART No.		
C47	300	500	CC21GP301M5	SI 300	D8-301	LT873	UC-533	5GA-73		
C48	500	500	CC21GP501M5	SI 300	D8-301	LT873	UC-533	5GA-73		
C49	5000	600	CC82P502V6	BPD-005	DD-502	BYA10D5	DC625	5HK-D5		①
C50	047	200	C88P473M2	P288N-047	DF-503	CUB2847	GEM-4147	2TM-847		
C51	0047	200	C88P473M2	P288N-047	D6-472	CUB8D47	GEM-8247	8TM-D47		
C52	25	200	C88P2122	P288N-22		CUB2922	GEM-2022	2TM-P22		
C53	.01	600	C-2147	P688N-1	D6-103	CUB8S1	GEM-611	6TM-S1		

① Not used in some versions.

② Chassis with serial numbers 10001-19999 use three 5mmf capacitors in parallel: N1400 (Part #CC20VK050F5), N330 (Part #CC20SK050F5), NPO (CC20CB050F5).

Chassis with serial numbers 30001-39999 use 5mmf NT50 (Part #CC20UJ050F5) and 13mmf N030 (Part #CC20HG130K5) in parallel.

## CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	FISHER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLOY PART No.		
RIA	10K		R561-182	B-14	A47-10K-S	Q11-16	U20	Muting	
B	8ohm			Not Req.	F8-3	Not Req.	U26	Power On-Off	
C	Switch			KB-1 or KR-1	SWE-12	76-1		Output Level	
R1	500K		R520-139				FL-250	Signal Meter Adj.	
R2	2(WW)		R520-135-2				FL-1-5K	Tuning Meter Adj.	
R3	2(WW)		R520-149						
R4	1500Ω								

\* Use KR with CRL "red label" controls and KB with "blue label" controls.

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		FISHER PART No.	NOTES	ITEM No.	RATING		FISHER PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R5	470K		RC20BF474K		R30	100K		RC20BF104K	
R6	470Ω		RC20BF471K		R31	470K		RC20BF474K	Note 2
R7	100Ω		RC20BF101K		R32	22K 5%	1	RC30BF223K	
R8	470K		RC20BF474K	Note 1	R33	2200Ω		RC20BF222K	
R9	100Ω		RC20BF101K		R34	3300Ω		RC20BF332K	
R10	1meg		RC20BF105K		R35	270Ω		RC20BF271K	
R11	2200Ω		RC20BF222K		R36	68K		RC20BF683K	
R12	8200Ω		RC20BF822K		R37	1000Ω		RC20BF102K	
R13	470Ω		RC20BF471K		R38	6800Ω		RC20BF682K	
R14	470K		RC20BF474K		R39	1500Ω		RC20BF152K	
R15	330K		RC20BF334K		R40	8900Ω		RC20BF892K	Note 1
R16	2200Ω		RC20BF222K		R41	150K		RC20BF154K	Note 1
R17	1000Ω		RC20BF102K		R42	220K		RC20BF224K	
R18	100Ω		RC20BF101K		R43	33K		RC20BF333K	
R19	330K		RC20BF334K		R44	1000Ω	1	RC20BF102K	
R20	1000Ω		RC20BF102K		R45	220K		RC20BF224K	
R21	100Ω		RC20BF101K		R46	2700Ω		RC20BF272K	
R22	1000Ω		RC20BF102K		R47	1meg		RC20BF105K	
R23	220Ω		RC20BF221K		R48	47K		RC20BF473K	
R24	22K		RC20BF223K		R49	33K		RC20BF333K	
R25	100K		RC20BF104K		R50	2200Ω		RC20BF222K	
R26	68K		RC20BF683K	Note 1	R51	220Ω	4(WW)	R-551-137	
R27	220K		RC20BF224K		R52A	330Ω	5(WW)	R-551-138	
R28	15meg		RC20BF156K		B	500Ω	0(WW)		
R29	220K		RC20BF224K		R53	2200Ω		RC20BF222K	

Note 1. Not used in some versions.

Note 2. Some versions may use 500K in this application (Part #RC20BF564K).

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	FISHER PART No.	Haldorson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thordorson PART No.	Triod PART No.
T1	117V ② .46A	375VCT ② .070A	8.3V ② 3.2A	T-630-113						

## PARTS LIST AND DESCRIPTIONS (Continued)

## COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		FISHER PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.		
L1	Ant. Matching Coil	L-509-139	15-1082	TV-172	6202	BC-501		
L2	Ant. Matching Coil	L-509-139	15-1082	TV-172	6202	BC-501		
L3	Antenna Coil	L-551-131						
L4	FL. Choke	L-509-140	19-1002 *	BC-563 *	4806 *			* Use two.
L5	Neutr. Coil	L-520-178	19-1002	BC-563	4606			2.2 Microhenries
L6	RF Choke	L-50086-6	19-1002	BC-563	4606			2.2 Microhenries
L7	RF Coil	L-551-187	19-1002	BC-563	4606			2.2 Microhenries
L8	RF Choke	L-50086-6	19-1000	BC-561	4602			1.25 Microhenries
L9	FL. Choke	L-520-156	19-1000	BC-561	4602			1.25 Microhenries
L10	Osc. Coil	L-551-191						
L11	RF Choke	L-50086-6	19-1002	BC-563	4606			2.2 Microhenries
L12	1st FM IF	ZZ-650-114	16-3487					
L13	FL. Choke	L-520-156	19-1000	BC-561	4602			1.25 Microhenries
L14	2nd FM IF	ZZ-509-130	16-3487	FM-254	1463			
L15	3rd FM IF	ZZ-509-130	16-3487	FM-254	1463			
L16	FL. Choke	L-520-156	19-1000	BC-561	4602			1.25 Microhenries
L17	FM Limiter Assy	L-551-191						
L18	Ratio Det. Assy	ZZ-552-170						
L19	RF Choke	L-3352	19-1002	BC-563	4606			2.2 Microhenries; IRC Part #CLA

## CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		FISHER PART No.	CBS PART No.	SYLVANIA PART No.	
M1	1N295		1N60	1N295	Limiting Rect. (Pigtail)
M2	1N295		1N60	1N295	Limiting Rect. (Pigtail)
M3	1N541		1N87	1N295	Ratio Det. (Pigtail) Note 1
M4	1N541		1N87	1N295	Ratio Det. (Pigtail) Note 1

Note 1. Some versions may use 1N542 in this application.

## MISCELLANEOUS

ITEM No.	PART NAME	FISHER PART No.	NOTES
M5	Lamp	J-520-137	6 Volt, 2 Watt
M6	Lamp	J-620-137	6 Volt, 2 Watt
M7	Tuning Cap.	C-651-119	FM, 3 Gang
M8	Meter	M-551-134	Signal Strength
M9	Meter	M-651-189	Tuning, Channel Center

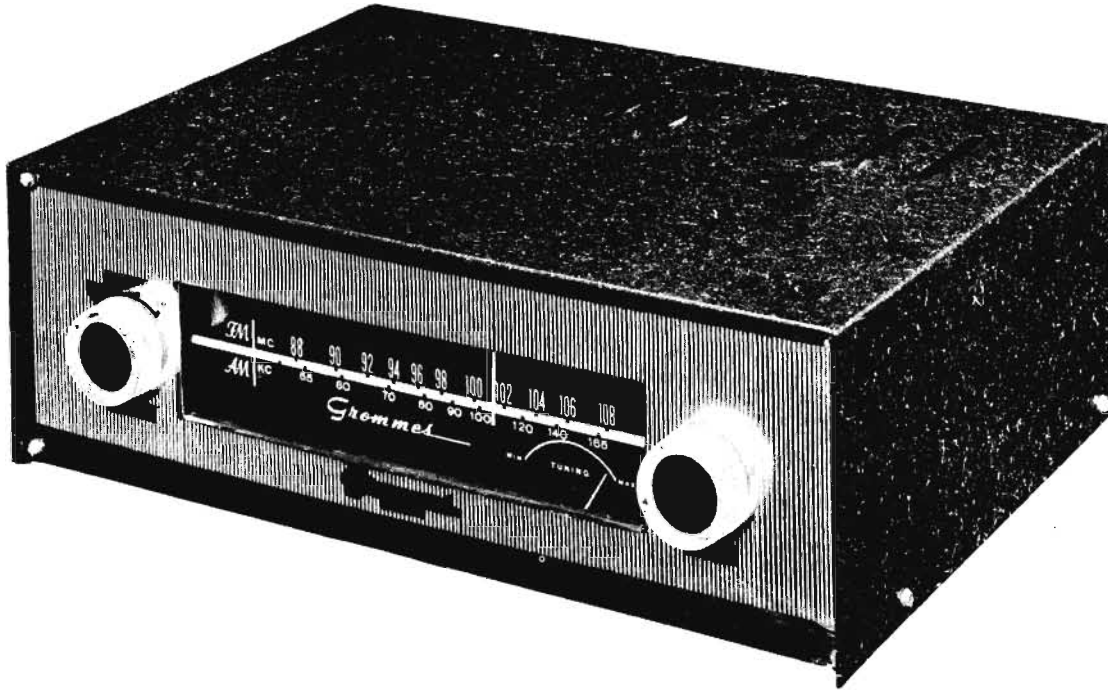
## CABINETS &amp; CABINET PARTS

(When Ordering Cabinets &amp; Cabinet Parts, Specify Model, Chassis &amp; Color)

NAME	PART NO.	DESCRIPTION
Knob	E-90049-5	Tuning
Knob	E-90049-3	On-Off, Muting
Panel	AS-630-104	Includes Escutcheon
Panel	AS-630-109	Leas Escutcheon
Dial Pointer	A-551-125	
Dial Glass	N-551-117	
Meter Glass	N-551-193	Signal Strength
Meter Glass	N-551-194	Center Channel Tuning

## WIRING DATA

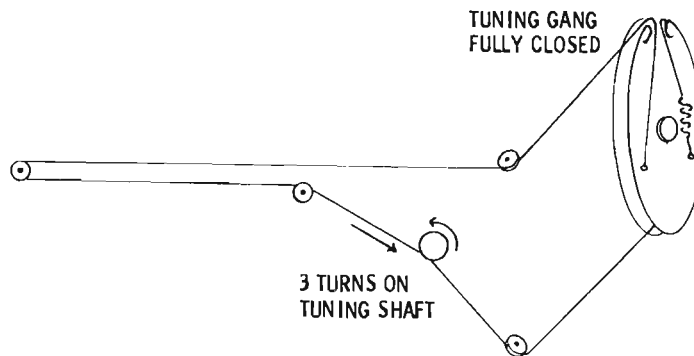
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors
Power Cord	8524 (Stranded) Available in Ten Colors
	Use BELDEN No. 1785-B (6 Ft. Length)
	1725-K (7 1/2 Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)



TRADE NAME	Grommes Model GRT-3	
MANUFACTURER	Precision Electronics, Inc, 9101 King Ave., Franklin Park, Illinois	
TYPE SET	AC Operated FM-AM Tuner	
TUBES	Twelve	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .43 Amp. @ 117 Volts AC (45 Watts)
TUNING RANGE - BROADCAST	535-1700 KC	FREQ. MOD. 88-108MC

**GROMMES  
 MODEL GRT-3**

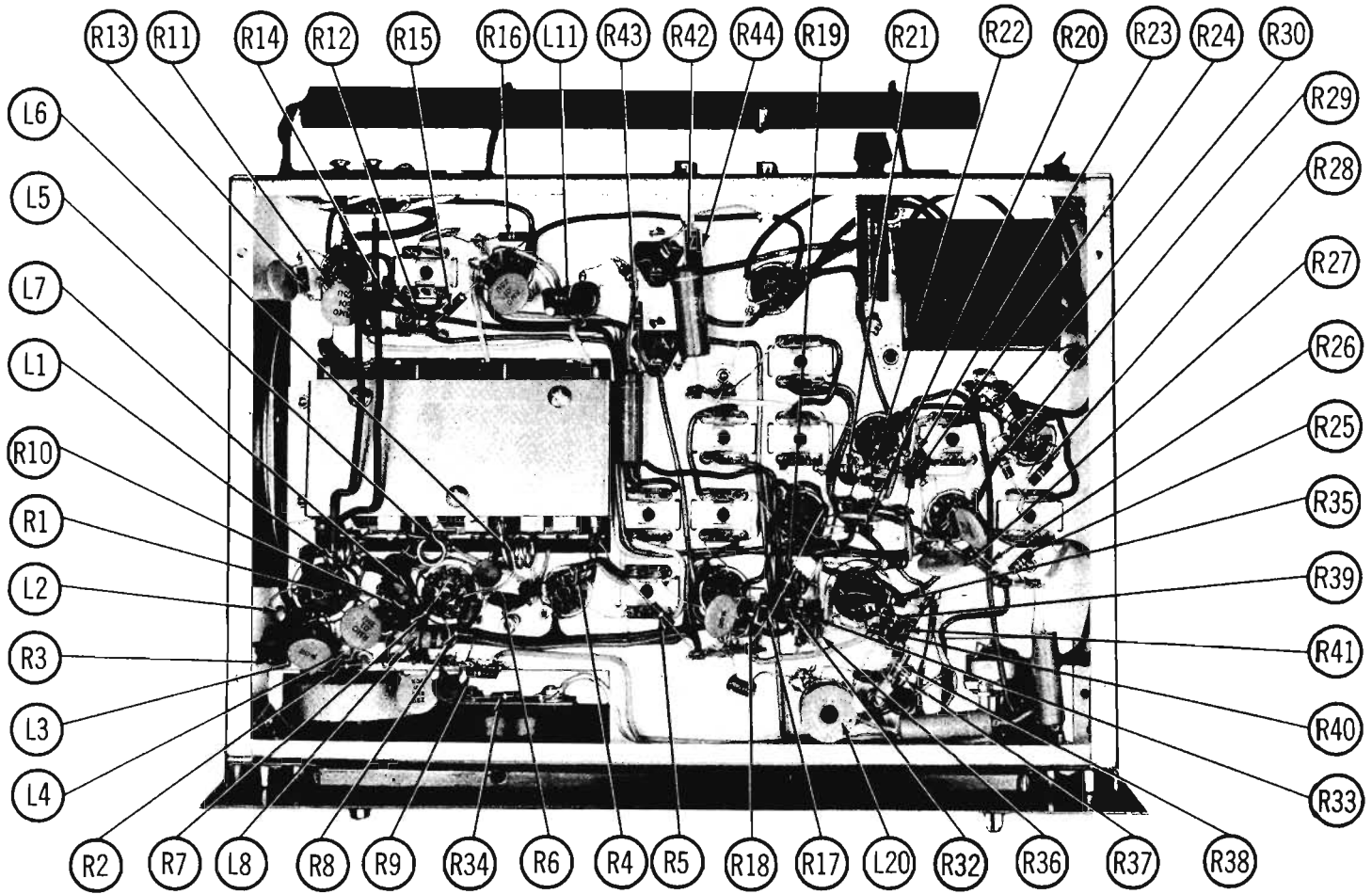
**DIAL CORD STRINGING**



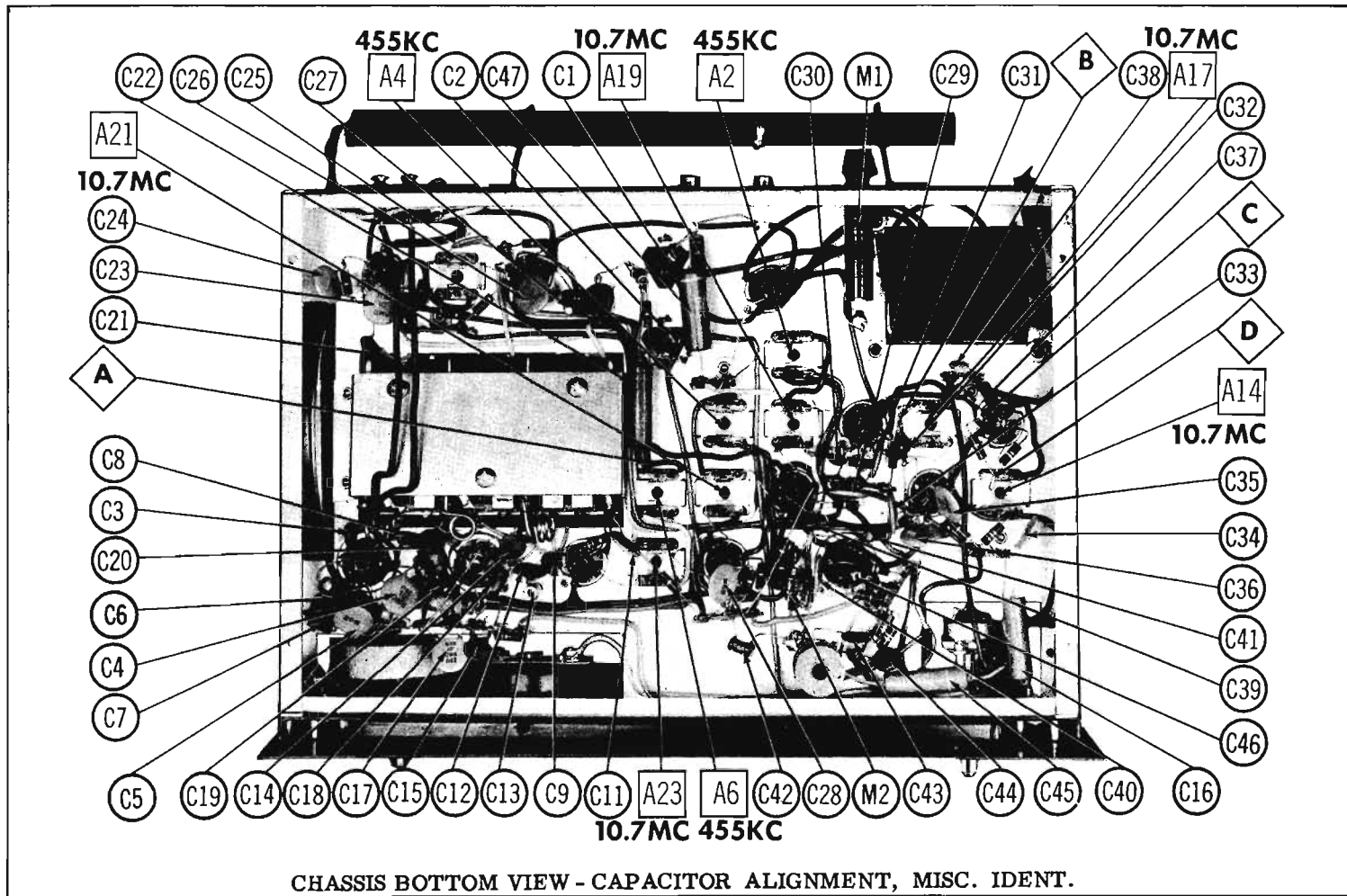
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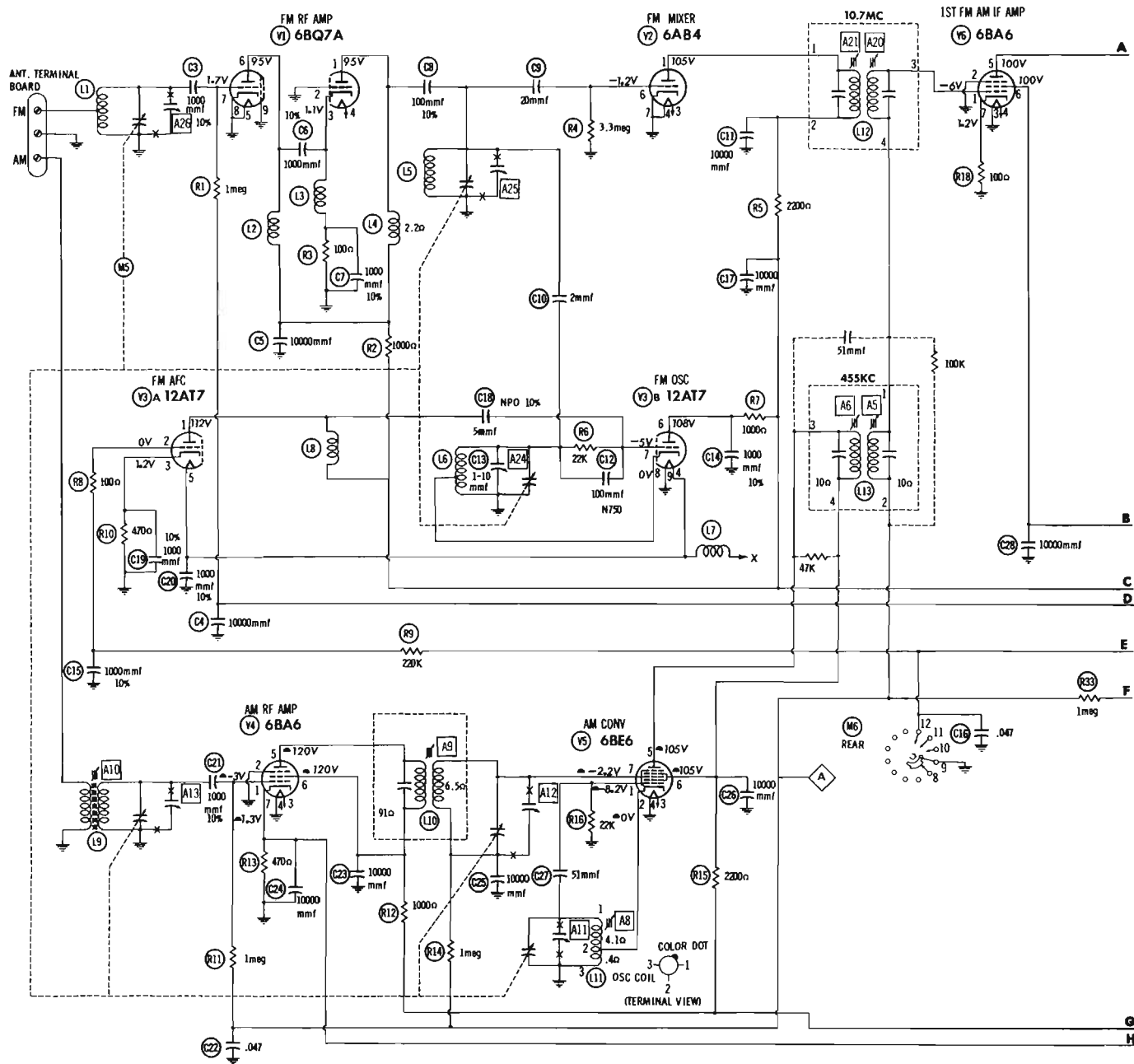
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H570

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CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

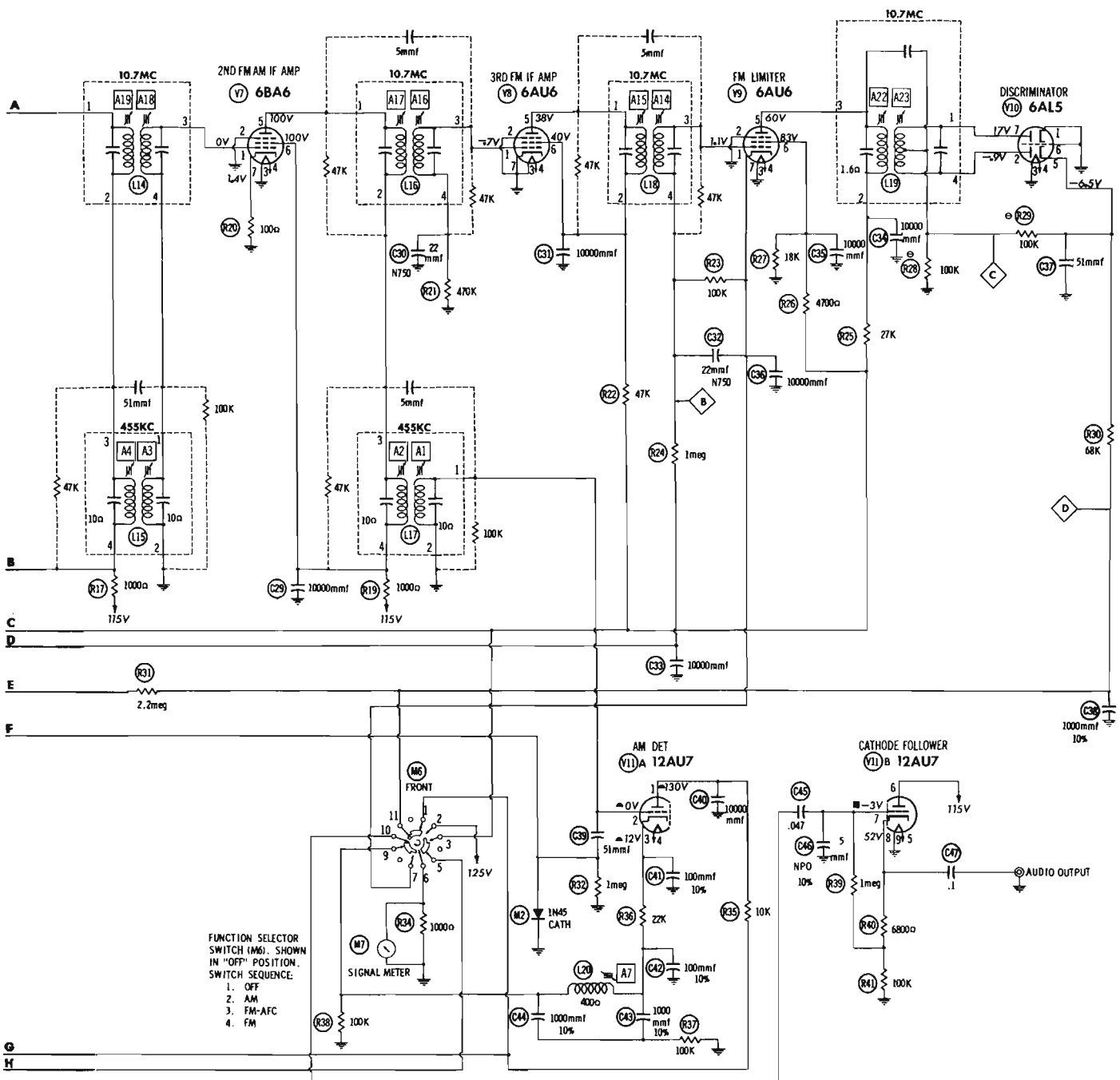




1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

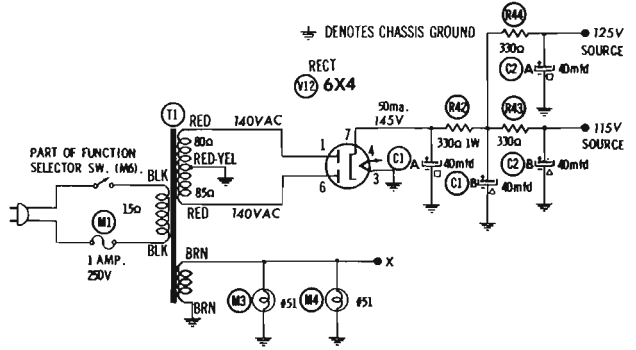


FUNCTION SELECTOR SWITCH (M6). SHOWN IN "OFF" POSITION. SWITCH SEQUENCE:  
 1. OFF  
 2. AM  
 3. FM-AFC  
 4. FM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BQ7A	†1600Ω	0Ω	100Ω	.1Ω	0Ω	†1600Ω	2.1meg	0Ω	0Ω
V2	6AB4	†2800Ω	0Ω	.1Ω	0Ω	0Ω	3.3meg	0Ω		
V3	12AT7	†660Ω	220K + 2.4meg	470Ω	.1Ω	.1Ω	†1600Ω	22K	0Ω	0Ω
V4	6BA6	≈ 2meg	0Ω	.1Ω	0Ω	≈ †1700Ω	≈ †1700Ω	≈ 470Ω		
V5	6BE6	≈ 22K	.4Ω	.1Ω	0Ω	≈ †2800Ω	≈ †2800Ω	≈ 2meg		
V6	6BA6	1meg	0Ω	0Ω	.1Ω	†1600Ω	†1600Ω	100Ω		
V7	6BA6	11Ω	0Ω	0Ω	.1Ω	†1600Ω	†1600Ω	100Ω		
V8	6AU6	470K	0Ω	0Ω	.1Ω	†48K	†48K	0Ω		
V9	6AU6	100K	0Ω	0Ω	.1Ω	†28K	†5300Ω	280K		
V10	6AL5	0Ω	100K	0Ω	.1Ω	170K	0Ω	100K		
V11	12AU7	≈ †11K	10Ω	120K	.1Ω	.1Ω	≈ †660Ω	1.1meg	100K	0Ω
V12	6X4	80Ω	0Ω	0Ω	.1Ω	0Ω	85Ω	80K (MIN)		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.  
 † MEASURED FROM PIN 7 OF V12.  
 • MEASURED IN "AM" POSITION.  
 ■ MEASURED FROM PIN 8 OF V11.





# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01mfd	High side to pin 7 (grid) of 6BE6 (V5). Low side to chassis.	455KC (400v Mod)	AM	Tuning gang fully open	DC probe to point $\text{\textcircled{A}}$ . Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum output.
2. "	"	455KC (10KC Mod)	"	"	AC probe to audio output. Common to chassis.	A7	Adjust for MINIMUM output.
3. "	High side to AM antenna terminal. Low side to chassis.	800KC (400v Mod)	"	800KC	DC probe to point $\text{\textcircled{A}}$ . Common to chassis.	A8, A9, A10	Adjust for maximum output.
4. "	"	1000KC	"	1000KC	"	A11	Adjust for maximum output. Repeat steps 3 and 4.
5. "	"	1500KC	"	1500KC	"	A12, A13	Adjust for maximum output.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6. .01mfd	High side to pin 6 (grid) of 6AB4 (V2). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe to point $\text{\textcircled{B}}$ . Common to chassis.	A14, A15, A16, A17, A18, A19, A20, A21	Adjust for maximum deflection.
7. "	"	"	"	"	DC probe thru 1meg to point $\text{\textcircled{C}}$ . Common to chassis.	A22	"
8. "	"	"	"	"	DC probe to point $\text{\textcircled{D}}$ . Common to chassis.	A23	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND SCOPE

Use frequency modulated signal with 60v modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6. .01mfd	High side to pin 6 (grid) of 6AB4 (V2). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point $\text{\textcircled{B}}$ . Low side to chassis.	A14, A15, A16, A17, A18, A19, A20, A21	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7. "	"	"	"	"	Vert. Amp. thru 27K to point $\text{\textcircled{C}}$ . Low side to chassis.	A22	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
8. "	"	"	"	"	Vert. Amp. to point $\text{\textcircled{D}}$ . Low side to chassis.	A23	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A22 for maximum amplitude and straightness of crossover lines.

### FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9. 270 $\Omega$ Carbon Resistor	High side to FM antenna terminal. Low side to chassis.	103MC	FM	103MC	DC probe to point $\text{\textcircled{B}}$ . Common to chassis.	A24, A25, A26	Adjust for maximum deflection.
If receiver fails to track properly, steps 10 and 11 should be followed.							
10. "	"	"	"	"	"	L5, L1	Adjust for maximum deflection by compressing or expanding coil turns. Recheck A25 and A26.
11. "	"	88MC	"	88MC	"	L6	Adjust for maximum deflection by compressing or expanding coil turns. while rocking tuning gang. Repeat steps 9, 10 and 11.

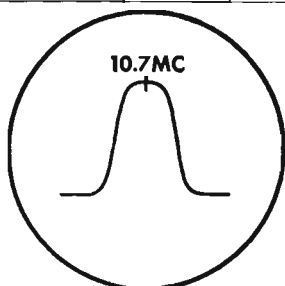


FIG. 1

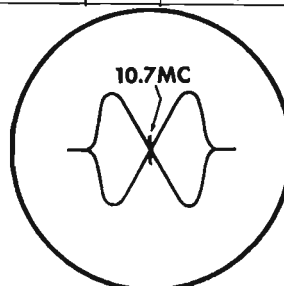


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES ( GENERAL ELECTRIC, SYLVANIA )

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	9BQ7A		V7	2nd. FM-AM IF Amp.	6BA6	
V2	FM Mixer	6A94		V8	3rd. FM IF Amp.	6AU6	
V3	FM Osc. - FM AFC	12AT7		V9	FM Limiter	6AU6	
V4	AM RF Amplifier	6BA6		V10	Discriminator	6AL5	
V5	AM Converter	6BE6		V11	AM Det. - Cath. Follower	12AU7	
V6	1st. FM-AM IF Amp.	6BA6		V12	Rectifier	8X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT.	GROMMES PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.	
C1A	#40	150		AFH2-14	XB0141	FP212	TMD-11	D-080	TVL-2428	
C1B	#40	150								
C2A	#40	150		AFH2-14	XB0141	FP212	TMD-11	D-080	TVL-2428	
C2B	#40	150								

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT.	GROMMES PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C3	1000									10%
C4	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C5	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C6	1000									10%
C7	1000									10%
C8	100			NPO-S1100	D6-101	CTA8TIC	ZT-531	5TCC-T1		10%
C9	20			SI 20	D6-200	CTA8Q2C	ZT-542	5GA-Q2		10%
C10	2			NPO-S1 2	TCZ-2R2	CTA8V22C		5TCCB-V22		10%
C11	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C12	100			N750-D1 100	DTN-100	C10T1U	NT-531	5TCU-T1		N750
C13	1-10									
C14	1000									10%
C15	1000									10%
C16	.047	200		P288N-047	DF-503	CUB2S47	GEM-4147	2TM-S47		
C17	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C18	5									NPO 10%
C19	1000			NPO-S1 5			ZT-555			
C20	1000									10%

## PARTS LIST AND DESCRIPTIONS (Continued)

### CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT.	GROMMES PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C21	1000									
C22	.047	200		P288N-047	DF-603	CUB2S47	GEM-4147	2TM-S47		10%
C23	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C24	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C25	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C26	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C27	51			SI 51	D6-500	LT8Q5	UC-545	5GA-Q5		
C28	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C28	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C30	22			N750-D1 22	DTN-22	C10Q22U		5TCU-Q22		N750
C31	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C32	22			N750-D1 22	DTN-22	C10Q22U		5TCU-Q22		N750
C33	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C34	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C35	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C36	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C37	51			SI 51	D6-500	LT8Q5	UC-545	5GA-Q5		10%
C38	1000									
C39	51			SI 51	D6-500	LT8Q5	UC-545	5GA-Q5		
C40	10000			BPD-01	DD-103	BYA10S1	DC511	5HK-S1		
C41	100			NPO-S1 100	D6-101	CTA8TIC	ZT-531	5TCC-T1		10%
C42	100									10%
C43	1000			NPO-S1 100	D6-101	CTA8TIC	ZT-531	5TCC-T1		10%
C44	1000									10%
C45	.047	200		P288N-047	DF-603	CUB2S47	GEM-4147	2TM-S47		
C46	5			NPO-S1 5			ZT-555			NPO 10%
C47	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1		

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		GROMMES PART No.	NOTES	ITEM No.	RATING		GROMMES PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	1meg				R12	10000			
R2	10000				R13	4700			
R3	1000				R14	1meg			
R4	3.3meg				R15	22000			
R5	22000				R16	22K			
R6	22K				R17	10000			
R7	10000				R18	1000			
R8	1000				R19	10000			
R9	220K				R20	1000			
R10	4700				R21	470K			
R11	1meg				R22	47K			

## PARTS LIST AND DESCRIPTIONS (Continued)

## RESISTORS (cont)

ITEM No.	RATING		GROMMES PART No.	NOTES	ITEM No.	RATING		GROMMES PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R23	100K				R34	1000Ω			
R24	1meg				R35	10K			
R25	27K				R36	22K			
R26	4700Ω				R37	100K			
R27	18K				R38	100K			
R28	100K			Note 1	R39	1meg			
R29	100K			Note 1	R40	6800Ω			
R30	68K				R41	100K			
R31	2.2meg				R42	330Ω		1	
R32	1meg				R43	330Ω			
R33	1meg				R44	330Ω			

Note 1. Some versions may use 68K in this application.

## COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		GROMMES PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil						
L2	RF Choke		19-1000	BC-561	4802		1 Microhenry ①
L3	Cathode Choke				4646		.24 Microhenry ①
L4	RF Choke						3.3 Microhenries ①
L5	FM RF Coil						
L6	FM Osc. Coil						
L7	Flt. Choke		19-1000	BC-561	4802		1 Microhenry ①
L8	RF Choke		19-1000	BC-561	4602		1 Microhenry ①
L9	Loop Stick						
L10	AM RF Trans.	55-278					
L11	AM Osc. Coil		14-1055	BC-393 *	70-06C *		
L12	1st. FM IF	56-361	16-3487	FM-254	1463		
L13	1st. AM IF	56-364	16-6756	BC-352	12-C1	RF-1	
L14	2nd. FM IF	56-362	16-3487	FM-254	1463		
L15	2nd. AM IF	56-370	16-6756	BC-353	12-C2	RF-2	
L16	3rd. FM IF	56-362	16-3487	FM-254	1463		
L17	3rd. AM IF	56-365	16-6756	BC-353	12-C2	RF-2	
L18	FM Limiter	56-362	16-3487	FM-254	1463		
L19	Discriminator	56-363	17-3494	FM-254	1464		
L20	10KC Filter						

\* Disregard primary.

▲ Disregard capacity winding.

① IRC Part #CLA.

## PARTS LIST AND DESCRIPTIONS (Continued)

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	GROMMES PART No.	Holdenston PART No.	Merit PART No.	Ram PART No.	Stoncor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ④.43A	280VCT ③.055A	6.3V ④4.1A	TPI-T		P-3048				

## FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			GROMMES PART No.	LITTELFUSE PART No.	BUSS PART No.			
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	1A 250V			312001. (3AG-1A-250V)	342001	AGC 1	8KP

## CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		GROMMES PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N45		1N52	1N34	AVC Rect. (Pigtail) Alternate Type 1N60

## MISCELLANEOUS

ITEM No.	PART NAME	GROMMES PART No.	NOTES
M3	Lamp		#51
M4	Lamp		#51
M5	Lamp Tuning Cap.		6 Gang (AM Sections: Ant. 26-529 mmf, RF 28-533 mmf, Osc. 26-198 mmf)
M6	Switch		On-Off, Function, Rotary Wafer Type
M7	Meter		Signal

A22  
10.7MC

A24  
103MC  
FM OSC

L12

A5  
455KC

L13

A26  
103MC  
FM ANT

A13  
1500KC  
AM ANT

A25  
103MC  
FM RF

A12  
1500KC  
AM RF

A9  
600KC  
AM

A11  
1000KC  
AM

A8  
600KC  
AM

A10  
600KC  
AM

L15  
A3  
455KC

L17  
A1  
455KC

L16  
A18  
10.7MC

A7  
10KC

L14

A20

10.7MC

A15

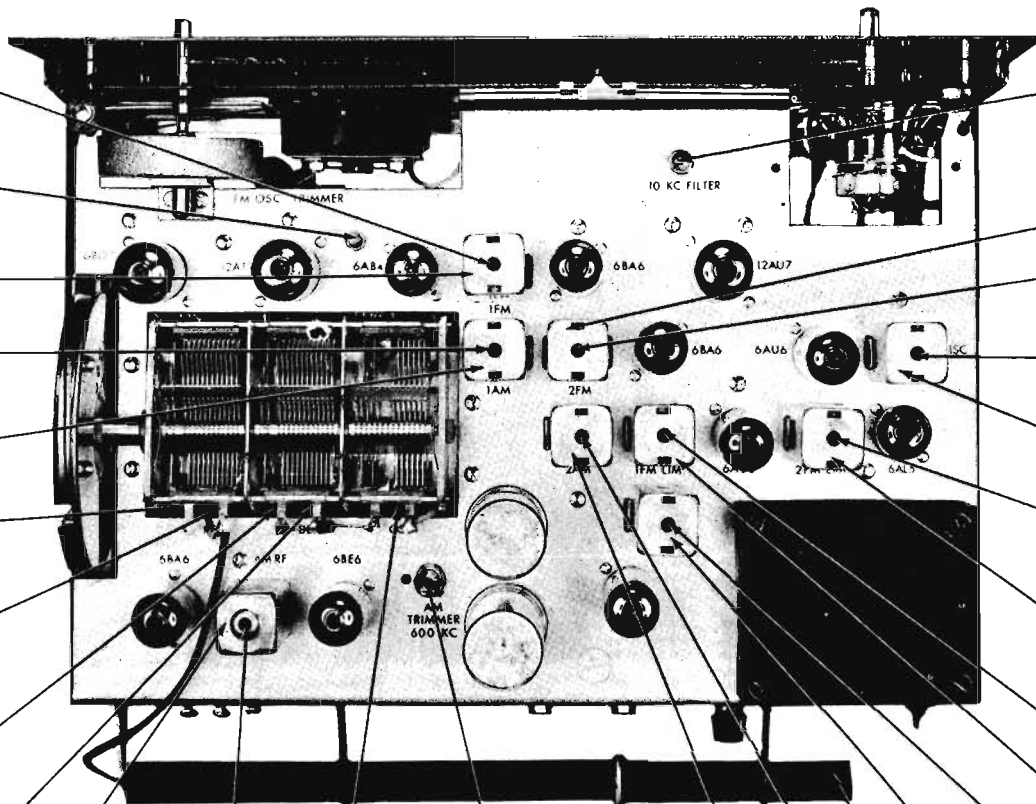
10.7MC

L19

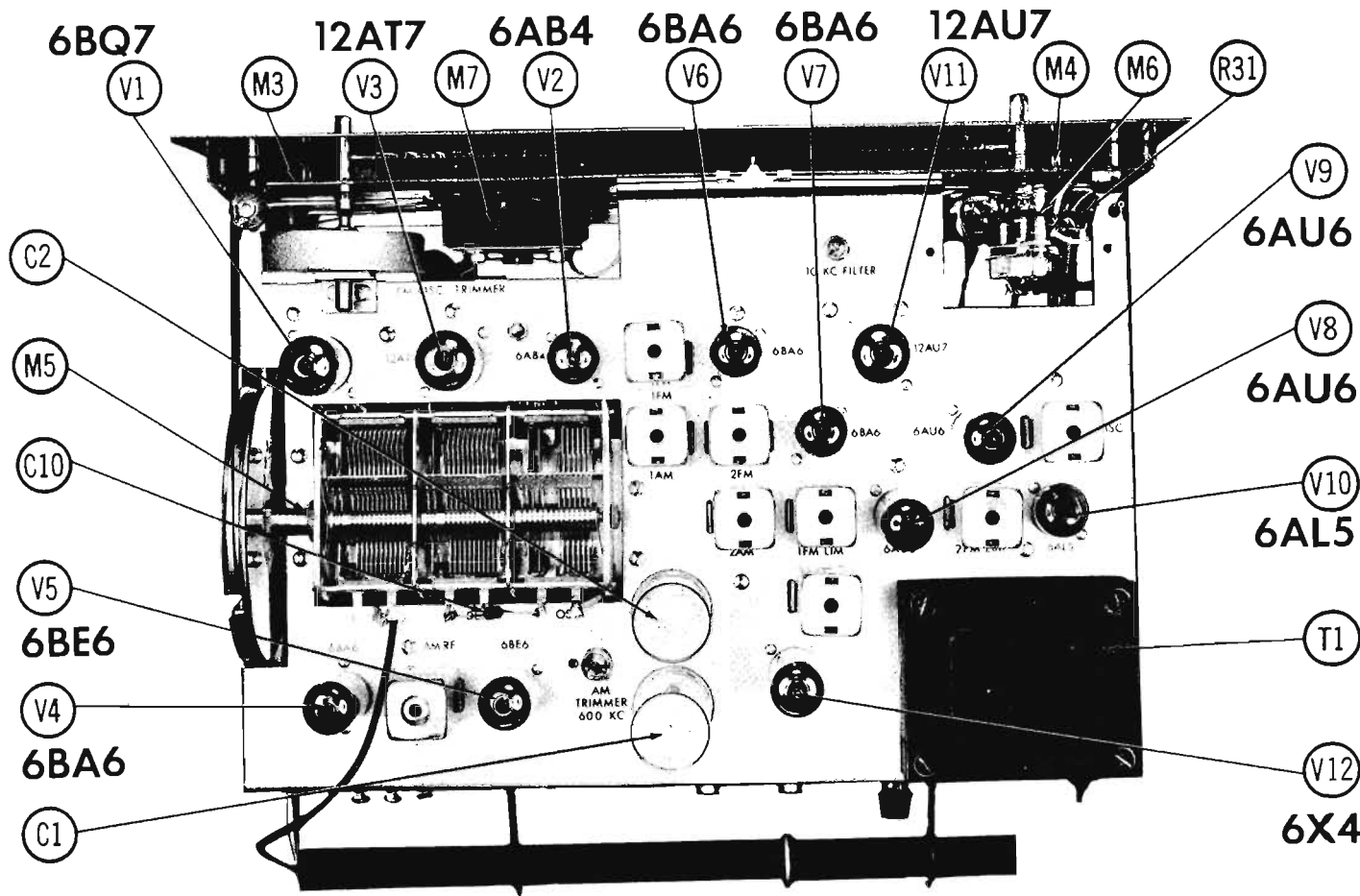
A16

10.7MC

L18



CHASSIS-TOP VIEW INDUCTOR AND ALIGNMENT IDENTIFICATION



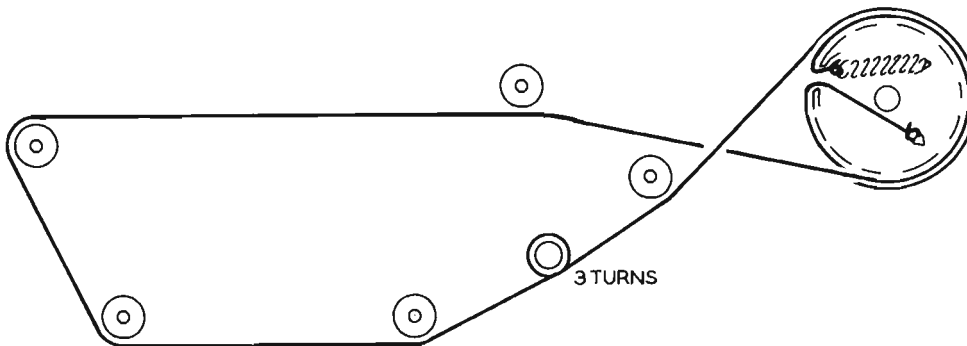
CHASSIS-TOP VIEW



TRADE NAME	Harman-Kardon Model FM-100	
MANUFACTURER	Harman-Kardon, Inc., 520 Main St., Westbury L. L., New York	
TYPE SET	AC Operated FM Tuner	
TUBES (Eight)	Types 6BK7A RF Amp., 12AT7 Osc. AFC, 6BA6 1st IF Amp., 6AU6 2nd IF Amp., 6AU6 Limiter, 6AL5 Disc., 12AU7A Squelch Amp. -Cath. Follower, 6C4 Meter Amp.	
POWER SUPPLY	105-125 Volts AC - 60 Cycles	RATING .36 Amp. @ 117 Volts AC (32 Watts)
FREQ.MOD.	88MC - 108MC	

**HARMAN-KARDON  
 MODEL FM-100**

TUNING GANG FULLY CLOSED



## DIAL CORD STRINGING

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier-Mixer	6BK7A		V5	Limiter	6AU6	
V2	Oscillator-AFC	12AT7		V6	Discriminator	6AL5	
V3	1st IF Amplifier	6BA6		V7	Squelch Amp. - Cathode Follower	12AU7A	
V4	2nd IF Amplifier	6AU6		V8	Meter Amplifier	6C4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	HARMAN-KARDON PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	#40	150	JE781436C						
C1B	#60	150							
C	60	150							
C2	4	150		PR8150V4	BBR4-150	TC40	TD-4-150	FM-1504	TVA-1412

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	HARMAN-KARDON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLOY PART No.	SPRAGUE PART No.		
C3	470			BPD-00047	D8-47L	LT8747	GP-470	UC-5347	5GA-T47		
C4	47			N750-SI 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C5	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C6	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C7	.68				TC2-R68						
C8	2.2			NP0-SI 2.2	TC2-R22	C10V22C	TCO-2.2		5TCCB-V22		
C9	100			N750-SI 100	TCN-100	C10TIU	TC7-100	NT-531	5TCU-T1		
C10	1-10			BPD-00047	DD-47I	BYA10T47	ED-470	UC-5347	5GA-T47		
C11	10		JV20688								
C12	10			N750-SI 10	TCN-10	C10QIU	TC7-10	NT-541	5TCU-Q1		
C13	10			SI 10	D8-100	L10Q1	GP-10	UC-541	5GA-Q1		
C14	470			BPD-00047	DD-47I	BYA10T47	ED-470	UC-5347	5GA-T47		
C15	2500			SI 2500	D8-252	BYA10D25	ED-0025	UC-5225	5GA-D25		
C16	.05			BPD-05	DF-503	CU825		GEM-415	2TM-85		
C17	10	200		SI 10	D8-100	LT6Q1	GP-10	UC-541	5GA-Q1		
C18	470			BPD-00047	DD-47I	BYA10T47	ED-470	UC-5347	5GA-T47		
C19	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C20	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C21	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C22	47			N750-SI 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C23	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C24	47			N750-SI 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C25	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C26	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C27	100			N750-SI 100	TCN-100	C10TIU	TC7-100	NT-531	5TCU-T1		
C28	150			BPD-0001	DD-101	L10T1	ED-100	UC-531	5GA-T1		
C29	.1	200			DF-104	BC2P17		ACE401	2SE-P1		
C30	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C31	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C32	.1	200			DF-104	BC2P17		ACE401	2SE-P1		
C33	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C34	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C35	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		
C36	470			BPD-00047	DD-47I	BYA10T47	ED-470	UC-5347	5GA-T47		
C37	470			BPD-00047	DD-47I	BYA10T47	ED-470	UC-5347	5GA-T47		
C38	.05	200			DF-503	BC2S472		ACE615	2SE-S47		
C39	10000			BPD-01	DD-103	BYA6S1	ED-01	DC511	5HK-S1		

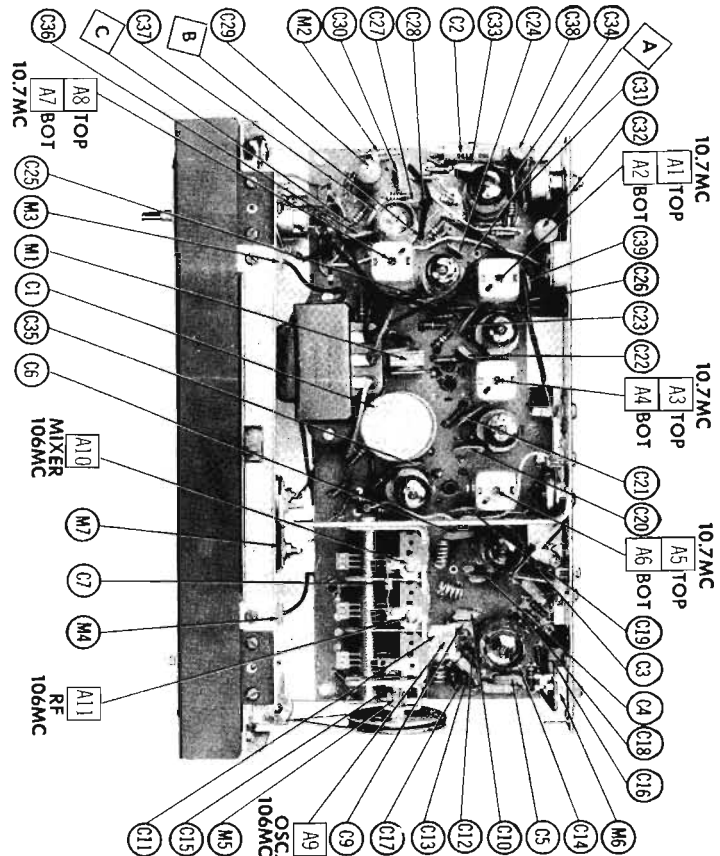
Note 1: Not used in some versions.

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	HARMAN-KARDON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLOY PART No.	
RLA	2Meg		RV104876				UF28A	AFC
B	5000Ω	1					UR53L	ANG (Auto Noise Gate)
C	Switch						US-28	
R2	1Meg		RV811800					Level
RS	3000Ω		RV104878				TA152L	Meter Adjust
B	Shaft				BLI-110		Not Req.	

\* Concentric Kit Equivalent; K-2 Kit, Base Elements & Shafts: B15-138, P1-123 Panel B11-114, R1-205 Rear, 76-1 Switch

## CHASSIS-TOP VIEW



# PARTS LIST AND DESCRIPTIONS (Continued)

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA		NOTES	ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Harman-Kardon	IRC			OHMS	WATT	Harman-Kardon	IRC	
			PART No.	PART No.					PART No.	PART No.	
R4	68Ω		BTS-68		R23	100K		BTS-100K		Note #1.	
R5	3.3Meg		BTS-3.3Meg		R24	100K		BTS-100K			
R6	15K		BTS-15K		R25	1Meg		BTS-1Meg			
R7	22K		BTS-22K		R26	100K		BTS-100K			
R8	1000Ω		BTS-1000		R27	2200Ω		BTS-2200			
R9	100Ω		BTS-100		R28	470K		BTS-470K			
R10	470K		BTS-470K		R29	1Meg		BTS-1Meg			
R11	3.3Meg		BTS-3.3Meg		R30	10K		BTS-10K			
R12	1000Ω		BTS-1000		R31	47K		BTS-47K			
R13	1Meg		BTS-1Meg		R32	6800Ω		BTS-6800			
R14	1000Ω		BTS-1000		R33	47K		BTS-47K			
R15	100K		BTS-100K		R34	1Meg		BTS-1Meg			
R16	1000Ω		BTS-1000		R35	68K		BTS-68K			
R17	1000Ω		BTS-1000		R36	68K		BTS-68K			
R18	100K		BTS-100K		R37	1000Ω		BTS-1000			
R19	15K		BTS-15K		R38	33K		BTS-33K			
R20	2200Ω		BTS-2200		R39	47K		BTS-47K			
R21	33K		BTS-33K		R40	330Ω		BTS-330			
R22	100K		BTS-100K		R41	330Ω		BTS-330			

Note #1. 560Ω Used in Some Versions.

Note #2. Not Used in All Versions.

## TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Harman-Kardon	Halldorson	Merit	Stancor	Thordarson	Triod
					PART No.	PART No.	PART No.	PART No.	PART No.	PART No.
T1	117V AC Ⓢ .36A	120V AC Ⓢ .037A tap Ⓢ 6.5V AC Ⓢ 2.45A			FT781419G					

## COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA			NOTES
		Harman-Kardon PART No.	MEISSNER PART No.	MILLER PART No.	
L1	Antenna Coil				.24 Microhenries; IRC Part #CLA
L2	RF Choke				3.3 Microhenries; IRC Part #CLA
L3	RF Coil	GL781543			1 Microhenry; IRC Part #CLA
L4	FM Osc. Coil	GL781544	19-1000	4602	
L5	Cath. Choke				3.3 Microhenries; IRC Part #CLA
L6	Mixer Coil	GL781543			
L7	1st FM IF	G7781491A	16-3490		
L8	RF Choke				50 Microhenries
L9	2nd FM IF	G7781570A	16-3490		
L10	FM Limiter	G7781570A	16-3490		
L11	FM Discr.	G7781492B	17-3491		
L12	RF Choke	G1041887			

## SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA					NOTES
	CURRENT		Harman-Kardon PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	
M1	.037A		Z781490A		R8065Q		R1JB	50

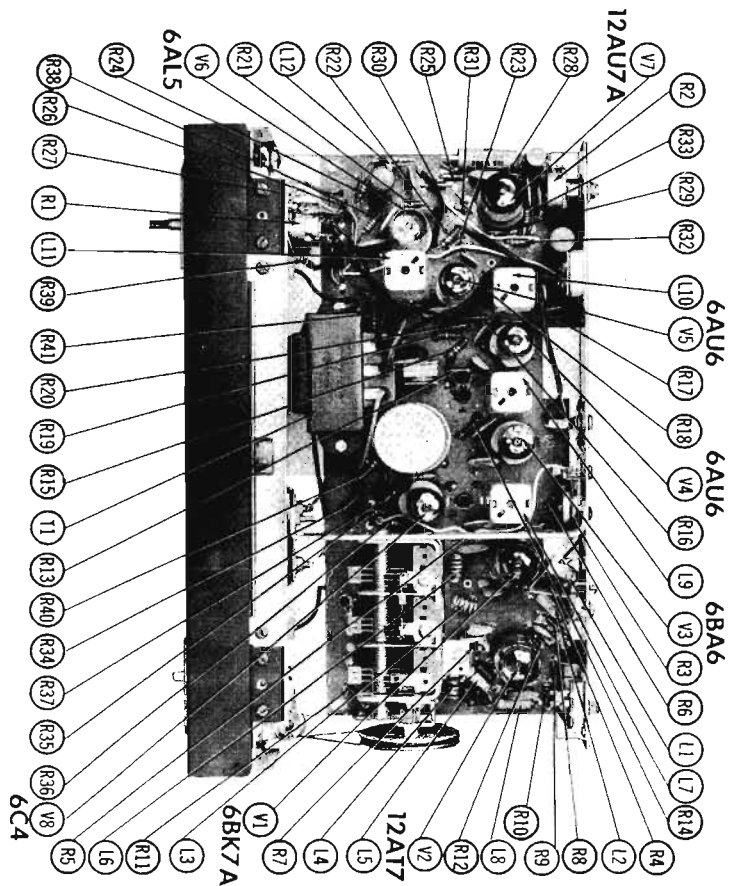
## CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		Harman-Kardon PART No.	SVLVANIA PART No.	
M2	1N34A	SC1041698	1N34A	Bias Rectifier (Pigtail)

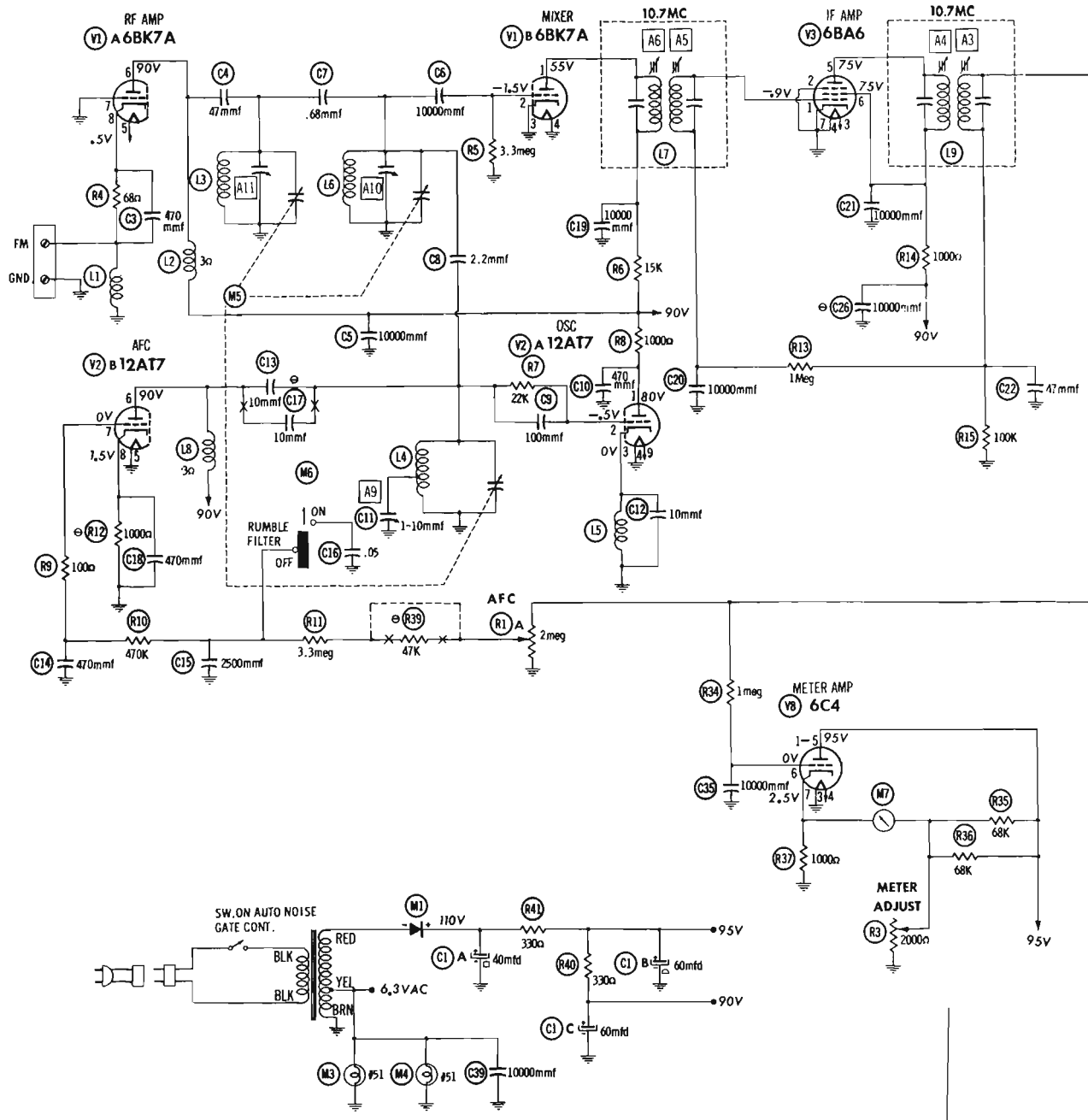
## MISCELLANEOUS

ITEM No.	PART NAME	Harman-Kardon	NOTES		
		PART No.	#51	#51	3 Gang
M3	Pilot Light		#51		
M4	Pilot Light		#51		
M5	Tuning Cap	JY1041873A	3 Gang		
M6	Switch	ES821350	Rumble Filter, Slide Type (8PBT)		
M7	Meter	Z1041688			

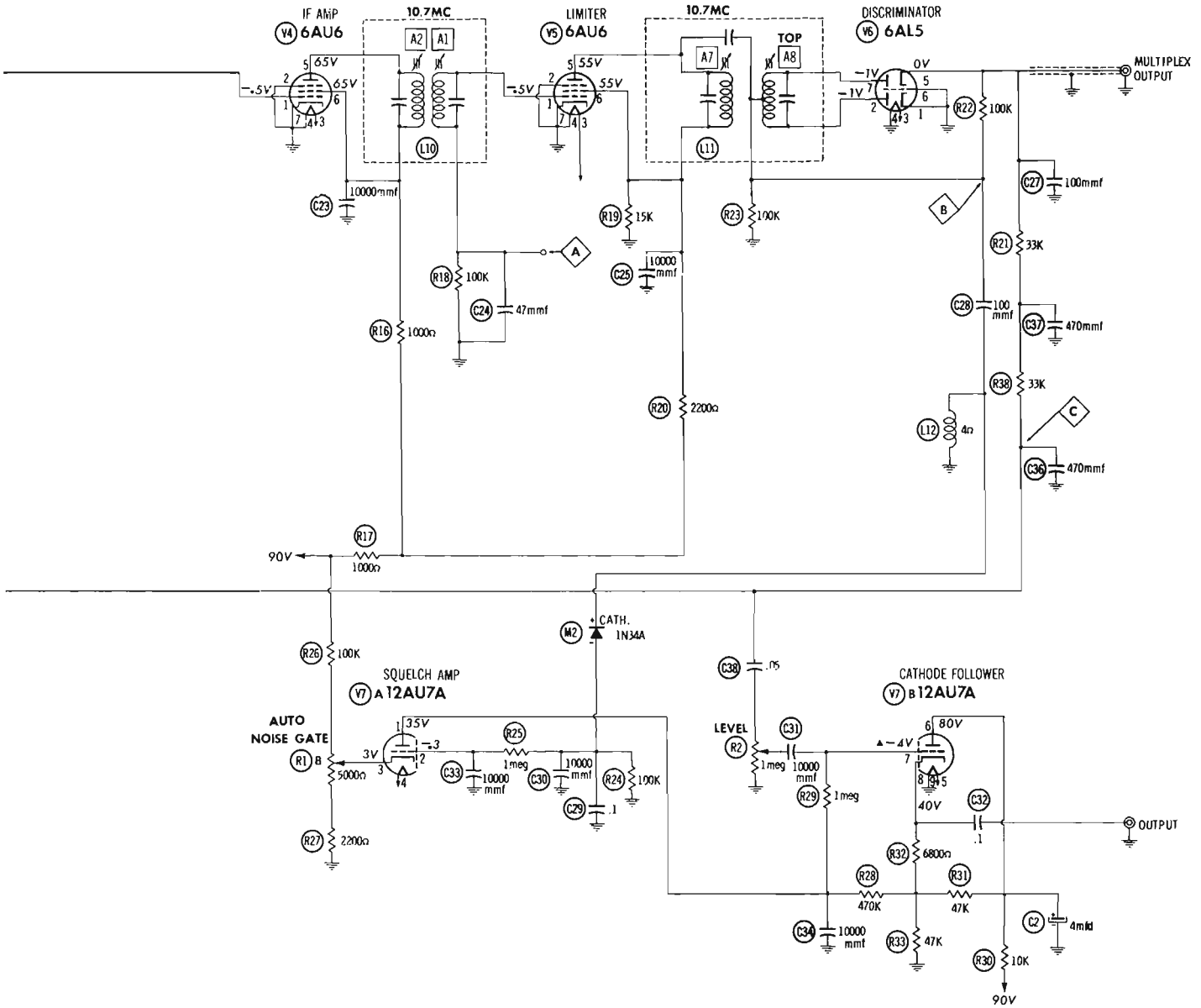
# CHASSIS—TOP VIEW







A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BK7A	† 16K	3.3Meg	0Ω	0Ω	.4Ω	† 650Ω	0Ω	68Ω	0Ω
V2	12A7	† 1600Ω	22K	.8Ω	0Ω	0Ω	† 650Ω	3.8Meg	1000Ω	.4Ω
V3	6BA6	1.1Meg	0Ω	.4Ω	0Ω	† 1600Ω	† 1600Ω	0Ω		
V4	6AU6	100K	0Ω	.4Ω	0Ω	† 2500Ω	† 2500Ω	0Ω		
V5	6AU6	100K	0Ω	.4Ω	0Ω	† 3800Ω	† 3800Ω	0Ω		
V6	6AL5	0Ω	100K	.4Ω	0Ω	180K	0Ω	100K		
V7	12AU7A	† 500K	1Meg	5200Ω	.4Ω	.4Ω	† 10K	1.5Meg	38K	0Ω
V8	6C4	† 330Ω	NC	0Ω	.4Ω	† 330Ω	1.2Meg	800Ω		

† MEASURED FROM OUTPUT OF M1.  
 NC NO CONNECTION  
 ▲ MEASURED FROM PIN 8 OF V7

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT BROWN ON SCHEMATIC DIAGRAM.

Ⓞ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

# ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT							
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.							
FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS	
1.	.01MFD	High side to FM RF stator lug on tuning gang. Low side to chassis.	10.7MC (unmod)	Point of non-interference.	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust for maximum deflection.
2.	"	"	"	"	DC probe to point (B). Common to chassis.	A7	"
3.	"	"	"	"	DC probe to point (C). Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE							
Use frequency modulated signal with 80% modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS	
1.	.01MFD	High side to FM RF stator lug on tuning gang. Low side to chassis.	10.7MC (450KC Swp)	Point of non-interference.	Vert. amp. to point (A). Low side to chassis.	A1, A2, A3, A4, A5, A6	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2.	"	"	"	"	Vert. amp. thru 100K to point (B). Low side to chassis.	A7	"
3.	"	"	"	"	Vert. amp. to point (C). Low side to chassis.	A8	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A7 for maximum amplitude and straightness of crossover lines.
FM RF ALIGNMENT							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS	
4.	270Ω carbon resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	106MC	106MC	DC probe to point (A). Common to chassis.	A9, A10, A11	Adjust for maximum deflection.
5.	"	"	90MC	90MC	"	L3, L4, L5	Adjust for maximum deflection by compressing or expanding coil turns. Repeat steps 4 and 5 until no further improvement can be made.

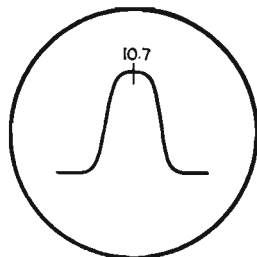


FIG. 1

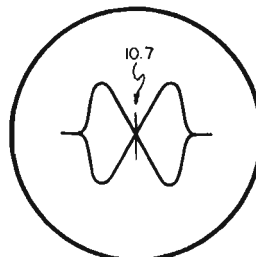


FIG. 2



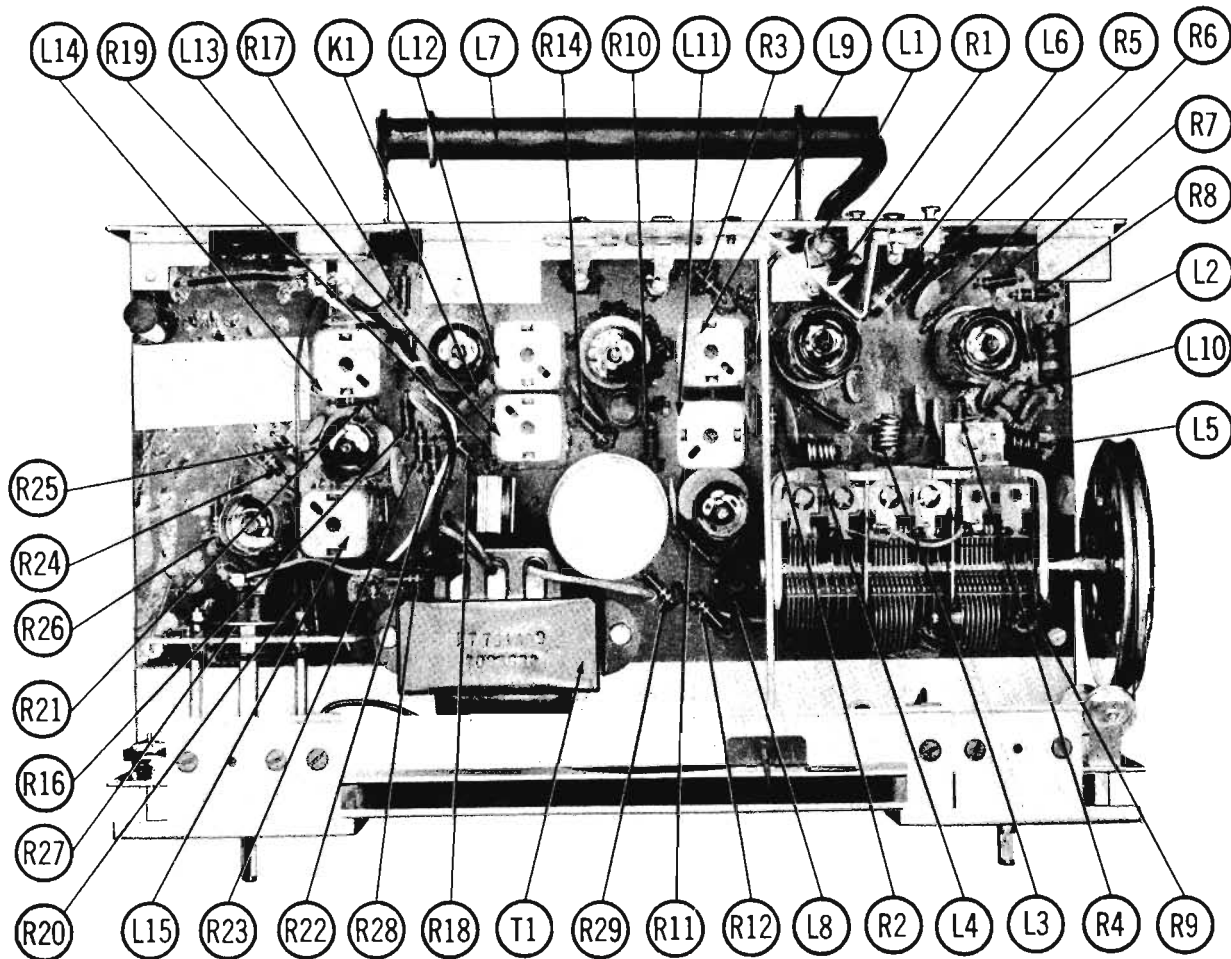
HARMAN-KARDON  
 MODEL T-10

TRADE NAME	Harman-Kardon Model T-10	
MANUFACTURER	Harman-Kardon, Inc., 520 Main St., Westbury, L. I., N. Y.	
TYPE SET	AC Operated FM-AM Tuner	
TUBES (Seven)	Types 12AT7 FM RF Amp.-Mixer, 12AT7 FM Osc.-AFC, 6BE6 AM Converter, 6BA6 1st. IF Amplifier, 6AU6 2nd. FM IF Amp.-AM Det., 6AU6 Limiter, 6AL5 Discriminator	
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING .33 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	535KC-1650KC	

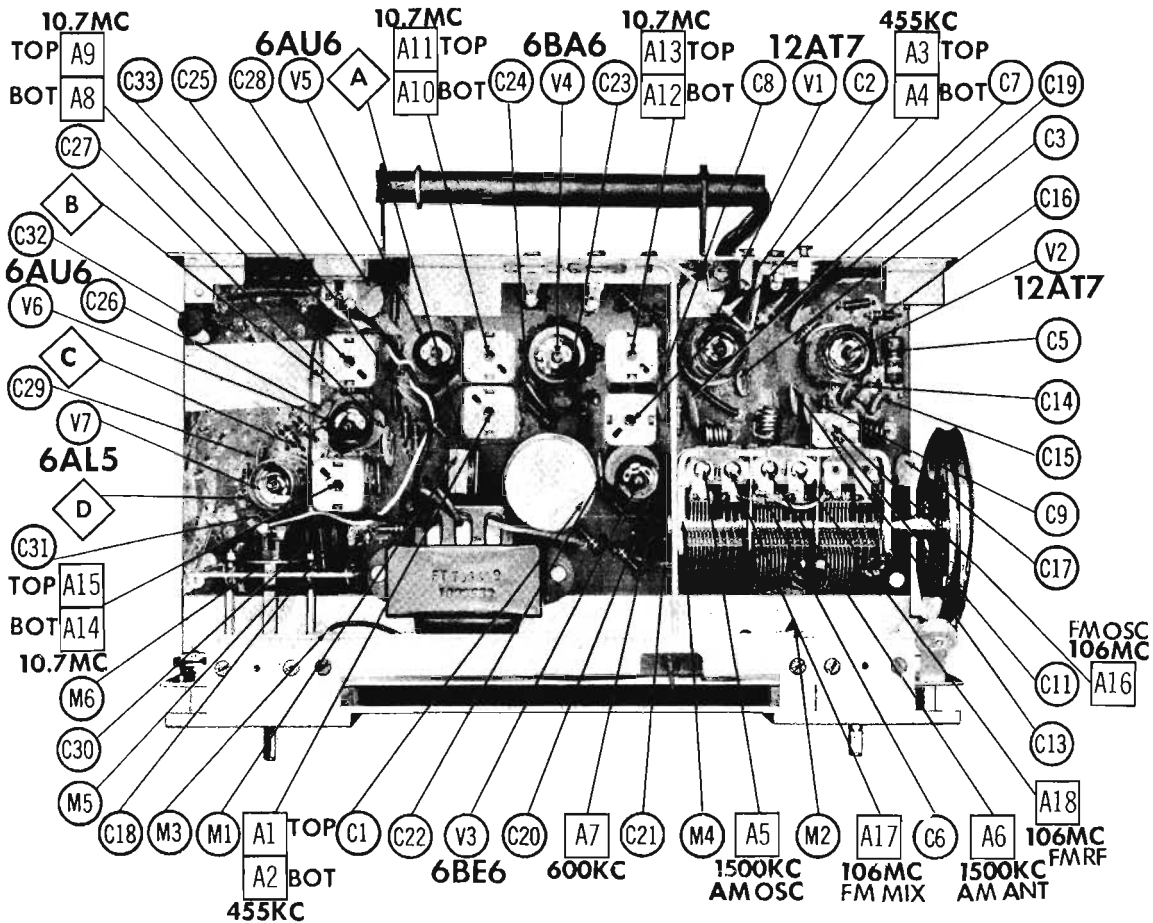
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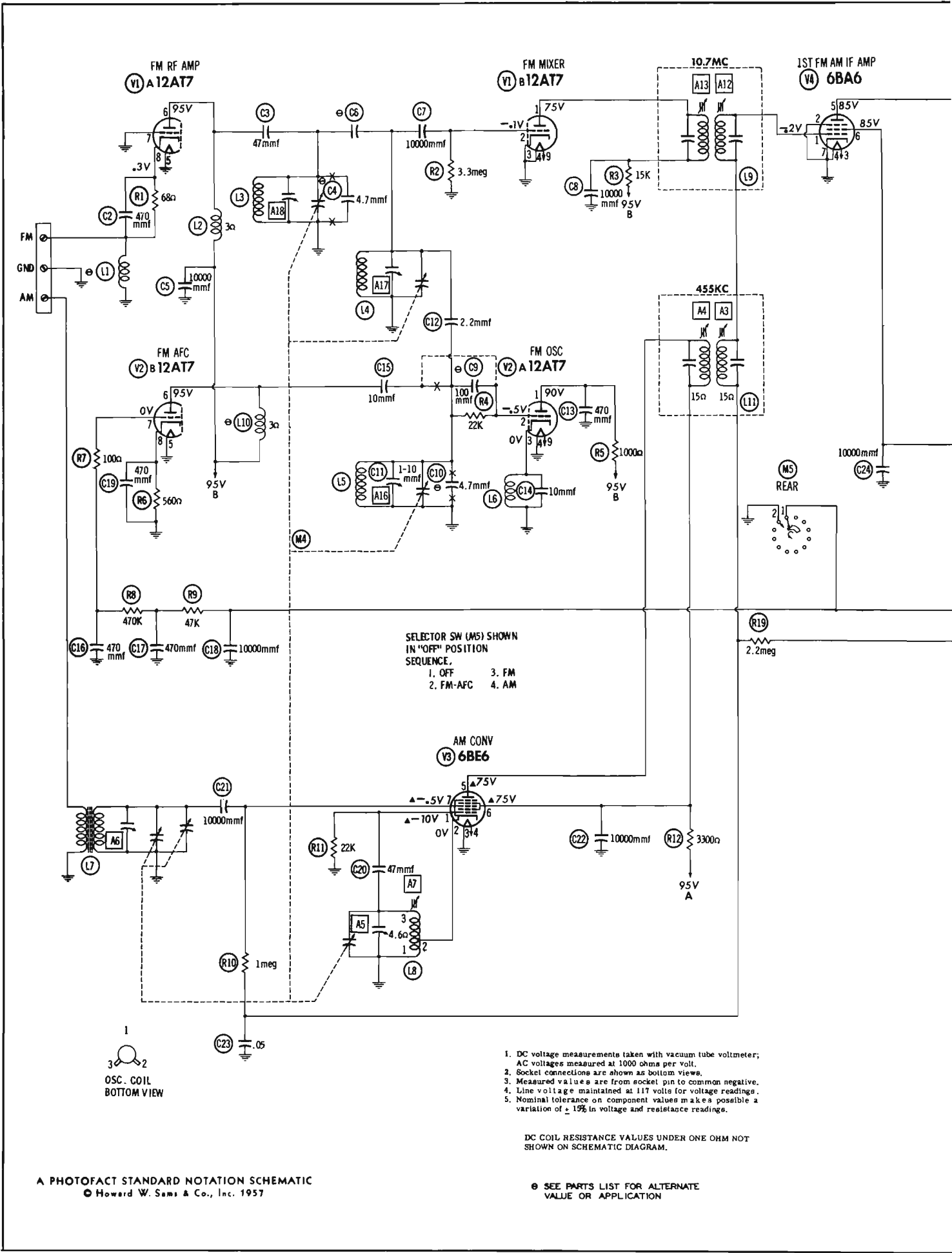
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CHASSIS TOP VIEW — RESISTOR IDENTIFICATION



CHASSIS TOP VIEW - CAPACITOR & ALIGN. IDENTIFICATION



SELECTOR SW (M5) SHOWN  
IN "OFF" POSITION  
SEQUENCE.  
1. OFF            3. FM  
2. FM-AFC      4. AM

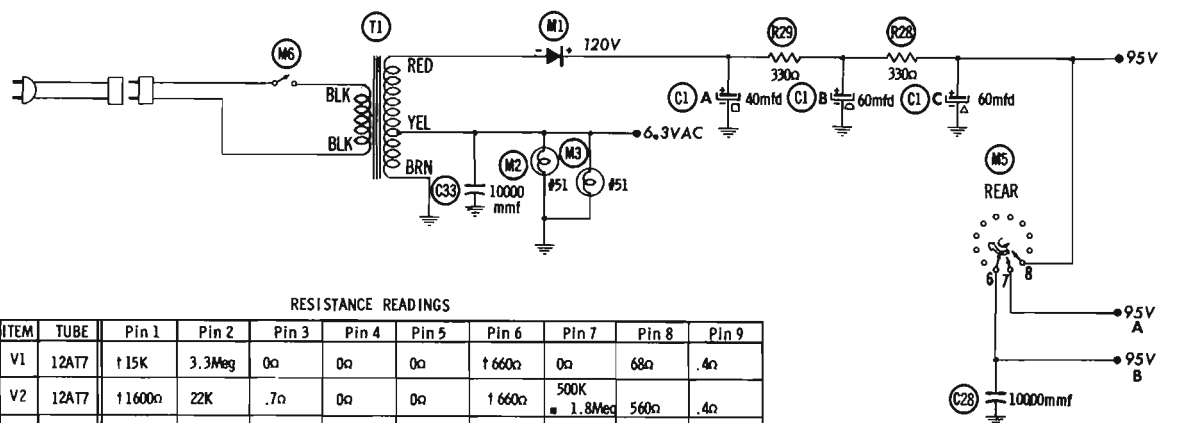
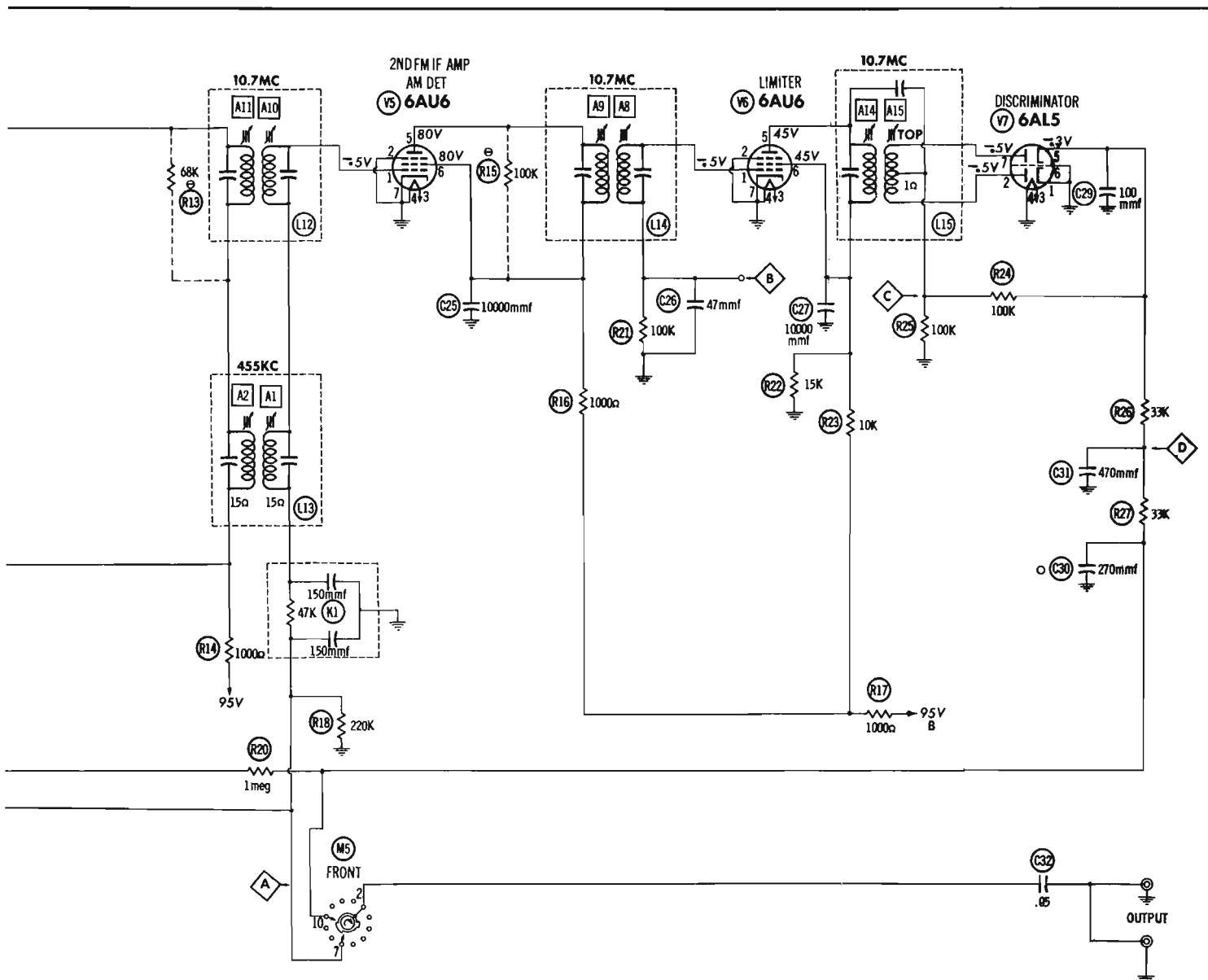
1  
3 2  
OSC. COIL  
BOTTOM VIEW

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 1\%$  in voltage and resistance readings.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.

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⊙ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AT7	† 15K	3.3Meg	0Ω	0Ω	0Ω	† 660Ω	0Ω	68Ω	.4Ω
V2	12AT7	† 1600Ω	22K	.7Ω	0Ω	0Ω	† 660Ω	500K	560Ω	.4Ω
V3	6BE6	22K	.5Ω	0Ω	.4Ω	† 3900Ω	† 3900Ω	† 3.5Meg		
V4	6BA6	2.5Meg	0Ω	.4Ω	0Ω	† 1600Ω	† 1600Ω	0Ω		
V5	6AU6	260K	0Ω	.4Ω	0Ω	† 2600Ω	† 2600Ω	0Ω		
V6	6AU6	100K	0Ω	.4Ω	0Ω	† 11K	† 11K	0Ω		
V7	6AL5	0Ω	100K	.4Ω	0Ω	200K	0Ω	100K		

† MEASURED IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.  
 ‡ MEASURED IN "AM" POSITION.  
 † MEASURED IN "FM-AFC" POSITION.  
 ‡ MEASURED FROM OUTPUT M1.



# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.  
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01MFD	High side to AM RF stator lug on tuning gang. Low side to chassis.	455KC (400vMod)	AM	1800KC	DC probe to point $\text{⊕}$ . Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2. Direct	High side to AM antenna terminal. Low side to chassis.	1500KC	"	1500KC	"	A5, A6	"
3. "	"	800KC	"	800KC	"	A7	"

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4. .01MFD	High side to FM RF stator lug on tuning gang. Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe to point $\text{⊕}$ . Common to chassis.	A8, A9, A10, A11, A12, A13	Adjust for maximum deflection.
5. "	"	"	"	"	DC probe to point $\text{⊕}$ . Common to chassis.	A14	"
6. "	"	"	"	"	DC probe to point $\text{⊕}$ . Common to chassis.	A15	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60v modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4. .01MFD	High side to FM RF stator lug on tuning gang. Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point $\text{⊕}$ . Low side to chassis.	A8, A9, A10, A11, A12, A13	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
5. "	"	"	"	"	Vert. Amp. to point $\text{⊕}$ . Low side to chassis.	A14	"
6. "	"	"	"	"	Vert. Amp. to point $\text{⊕}$ . Low side to chassis.	A15	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A14 for maximum amplitude and straightness of crossover lines.

### FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7. 270 $\Omega$ Carbon Resistor	High side thru 270 $\Omega$ to FM antenna terminal. Low side to chassis.	106MC	FM	106MC	DC probe to point $\text{⊕}$ . Common to chassis.	A16, A17, A18	Adjust for maximum deflection.
8. "	"	90MC	"	90MC	"	L3, L4, L5	Adjust for maximum deflection by compressing or expanding coil turns.

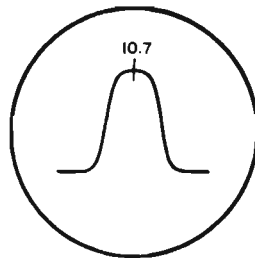


FIG. 1

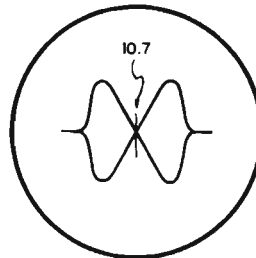


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp.-Mixer	12A7T	
V2	FM Osc.-AFC Limiter	12A7T	
V3	AM Converter	6BE6	
V4	1st. IF Amplifier	6BA6	

ITEM No.	USE	TYPE	NOTES
V5	2nd. FM IF Amp.-AM Det. Limiter	6AU6 6AU8 6AL5	
V6			
V7	Discriminator		

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Harman-Kardon PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	# 40	150	JE781439C	AFH14-35					TVL-3443, 2
B	# 60	150							
C	# 150	150							

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	Harman-Kardon PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C2	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		Note 2
C3	47			N750-S1 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C4	4.7			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		Note 1
C5	.68				TCZ-R88						
C7	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		Note 1
C8	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		
C9	100			N750-S1 100	TCN-100	C10Q100U	TC7-100	NT-531	5TCU-T1		Note 2
C10	4.7										
C11	1-10		JV20888								Note 2
C12	2.2			NPO-S1 2.2	TCZ-2R2	C10V47C	TCO-2.2		5TCCB-V22		
C13	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		Note 2
C14	47			N750-S1 10	TCN-10	C10Q10U	TC7-10	NT-541	5TCU-Q1		
C15	10			N750-S1 10	TCN-10	C10Q10U	TC7-10	NT-541	5TCU-Q1		Note 1
C16	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		
C17	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		Note 1
C18	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		
C19	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		Note 2
C20	47			N750-S1 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C21	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		Note 3
C22	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		
C23	.05	200			BC2847J				28S-947		Note 3
C24	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		
C25	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		Note 3
C26	47			N750-S1 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47		
C27	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		Note 3
C28	10000			BPD-01	DD-103	BYA8S1	GP-10000	DC511	5HK-S1		
C29	100			N750-S1 100	TCN-100	C10T100U	TC7-100	NT-531	5TCU-T1		Note 3
C30	270			BPD-00027	DD-271	L10T27	ED-270	UC-5327	5GA-T27		
C31	470			BPD-00047	DD-471	BYA10T47	ED-470	UC-5347	5GA-T47		Note 3
C32	.05	200			BC2847J				28E-847		
C33	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1		

Note 1. Some versions may use 1.2MOMF in this application.  
 Note 2. Not used in some versions.  
 Note 3. Some versions may use 470MMF in this application.

## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA			NOTES	ITEM No.	RATING		REPLACEMENT DATA			NOTES
	OHMS	WATT	Harman-Kardon PART No.	IRC PART No.				OHMS	WATT	Harman-Kardon PART No.	IRC PART No.		
R1	68Ω			BTS-68		Note 1	R16	1000Ω			BTS-1000	Note 2	
R2	1.3Meg			BTS-3.3Meg			R17	1000Ω			BTS-1000		
R3	16K			BTS-15K			R18	220K			BTS-220K		
R4	22K			BTS-22K			R19	2.2Meg			BTS-2.2Meg		
R5	1000Ω			BTS-1000			R20	1Meg			BTS-1Meg		
R6	500Ω			BTS-500			R21	100K			BTS-100K		
R7	100Ω			BTS-100			R22	15K			BTS-15K		
R8	470K			BTS-470K			R23	10K			BTS-10K		
R9	47K			BTS-47K			R24	100K			BTS-100K		
R10	1Meg			BTS-1Meg			R25	100K			BTS-100K		
R11	22K			BTS-22K			R26	33K			BTS-33K		
R12	3300Ω			BTS-3300			R27	33K			BTS-33K		
R13	68K			BTS-68K			R28	330Ω			BTS-330		
R14	1000Ω			BTS-1000			R29	330Ω			BTS-330		
R15	100K			BTS-100K									

Note 1. Some versions may use 10K in this application.  
 Note 2. Not used in some versions.

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Harman-Kardon PART No.	Hollidorn PART No.	Merit PART No.	Stoncor PART No.	Thordarsen PART No.	Triod PART No.
T1	117VAC @ .33A	120VAC @ .037A lap @ 6.3V @ 2.45A			F778149B					

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		Harman-Kardon PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	FM Ant. Coil					.24 Microhenry - Note 1 - IRC part #CLA 183 Microhenries IRC part #CLA
L2	RF Choke				4808	
L3	FM RF Coil	GL781543				1 Microhenry - IRC part #CLA 183 Microhenries - Note 2
L4	FM Mixer Coil	GL781543				
L5	FM Osc. Coil	GL781544				
L6	RF Choke		19-1000			
L7	Loop Stick	GL781479A				
L8	AM Osc. Coil					4808
L9	1st. AM IF	GT781491A				
L10	RF Choke					
L11	1st. AM IF	GT781493A				13-PCI
L12	2nd. AM IF	GT781491A				13-PCI
L13	2nd. AM IF	GT781493A				
L14	FM Limiter	GT781491A				
L15	Discriminator	GT781492A				

Note 1. Some versions use a 1 microhenry coil in this application.  
 Note 2. Loop stick includes tuning ring, part #P4181329A.

# PARTS LIST AND DESCRIPTIONS (Continued)

## COMPONENT COMBINATIONS

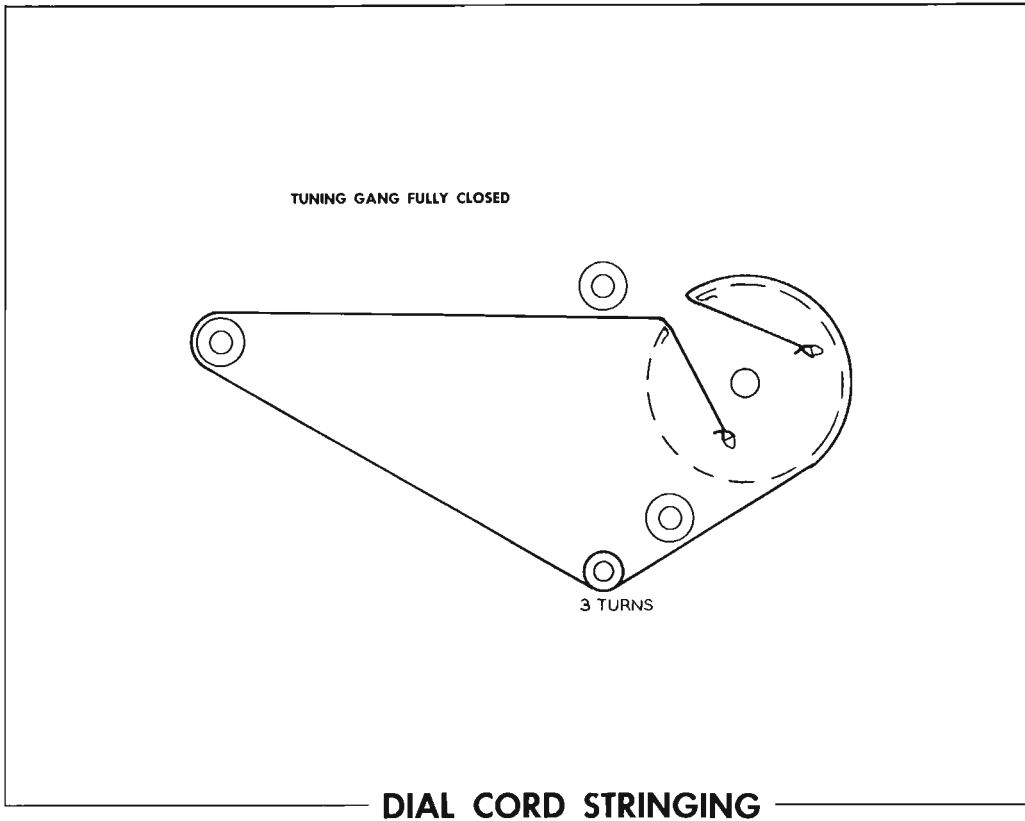
ITEM No.	USE	DESCRIPTION	Harman-Kardon PART No.	REPLACEMENT DATA
K1	AM Detector RF Filter	47K, 150MMF, 150MMF		Aerovox Centralab Cornell-Dubilier Erie Sprague PA-88 PC-51 117TM2 1403-02 D-3

## SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA				NOTES
		FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	
M1	.087A		RS085Q		8J1B	50

## MISCELLANEOUS

ITEM No.	PART NAME	Harman-Kardon PART No.	NOTES
M2	Dial Lamp		#81
M3	Dial Lamp		#51
M4	Tuning Cap.	JV781468D	8 Gang
M5	Switch	ER781480C	Function On-off
M6	Glass	P781415C	Dial
	Pointer	Z781482A	Dial
	Knob	P851043	Function
	Knob	P20778	Tuning
	Cabinet	P781444C	





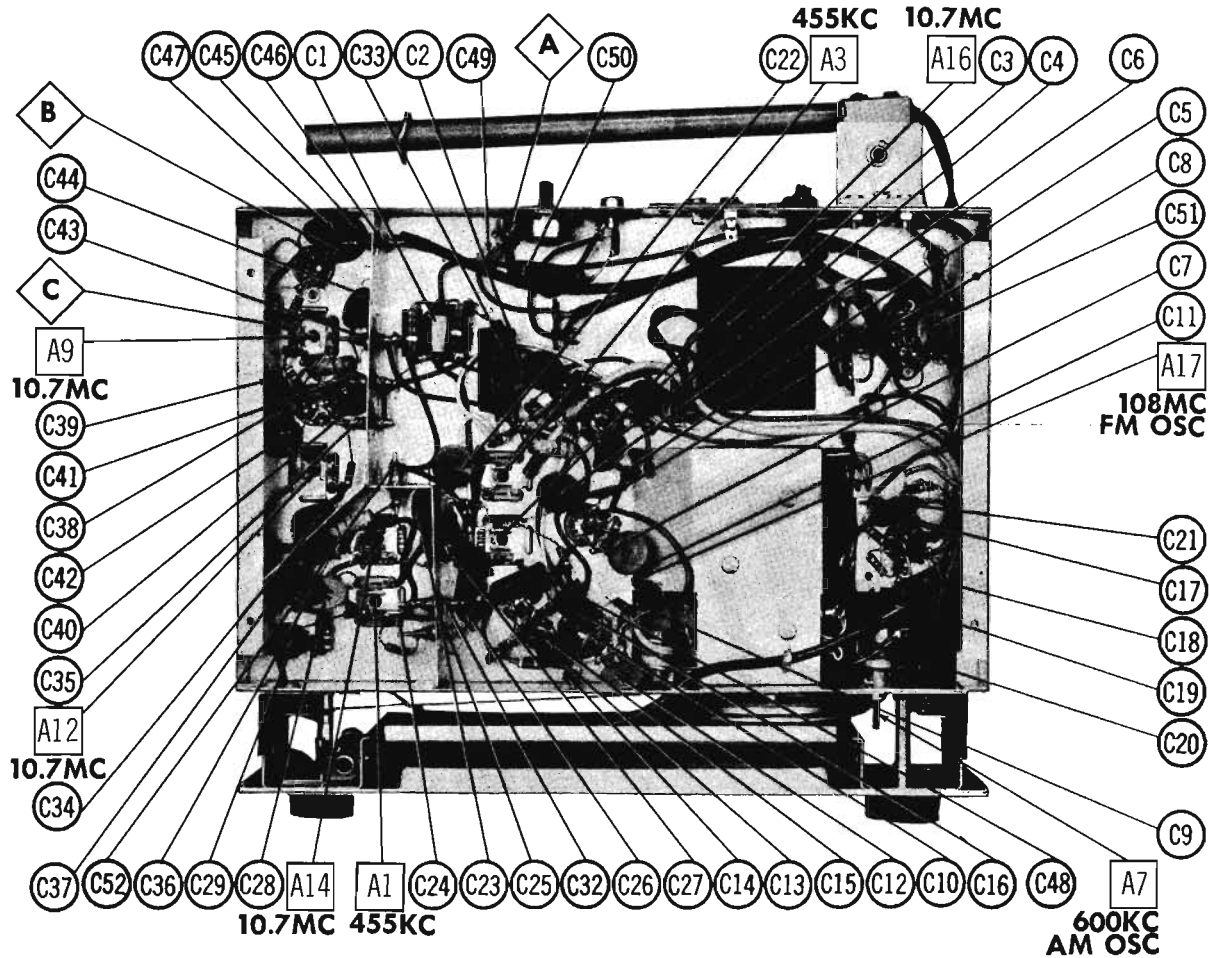
**KNIGHT MODEL  
 KN-100 (92SX401)**

TRADE NAME	Knight Model KN-100 (92SX401)		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Nine)	Types 6CB6 FM RF Amplifier, 6AB4 FM Mixer, 12AT7 FM Osc.-FM AFC, 6BE6 AM Converter, 6CB6 1st FM-AM IF Amp., 6CB6 2nd FM IF Amp.-AM Det.-AVC, 6AU6 FM Limiter, 6AL5 Discr., 6X4 Rectifier		
POWER SUPPLY	110-120 Volts AC-50/60 Cycles	RATING	.375 Amp. @ 117 Volts AC (37 Watts)
TUNING RANGE-BROADCAST	540-1600KC	FREQ. MOD.	88-108MC

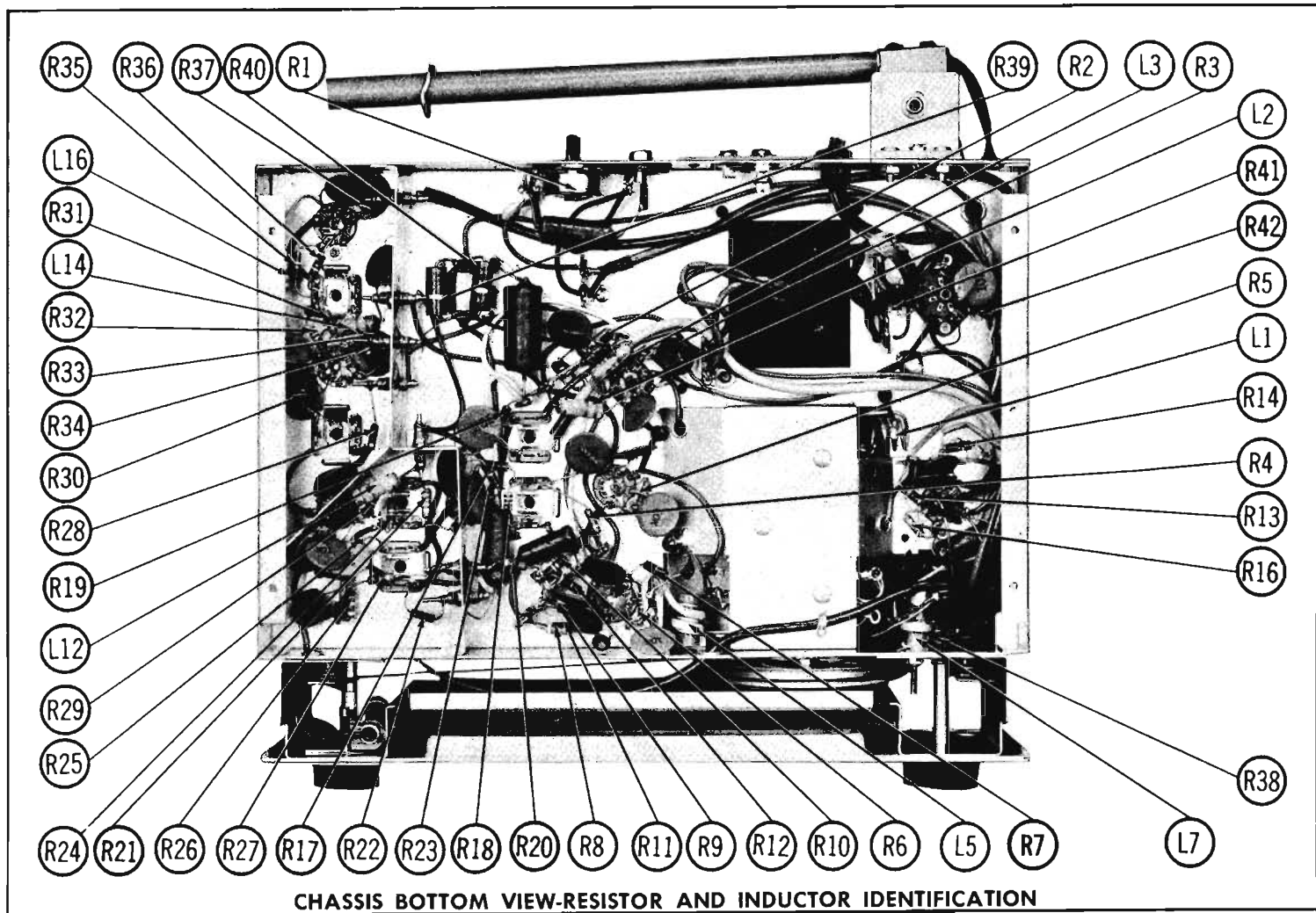
**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H501

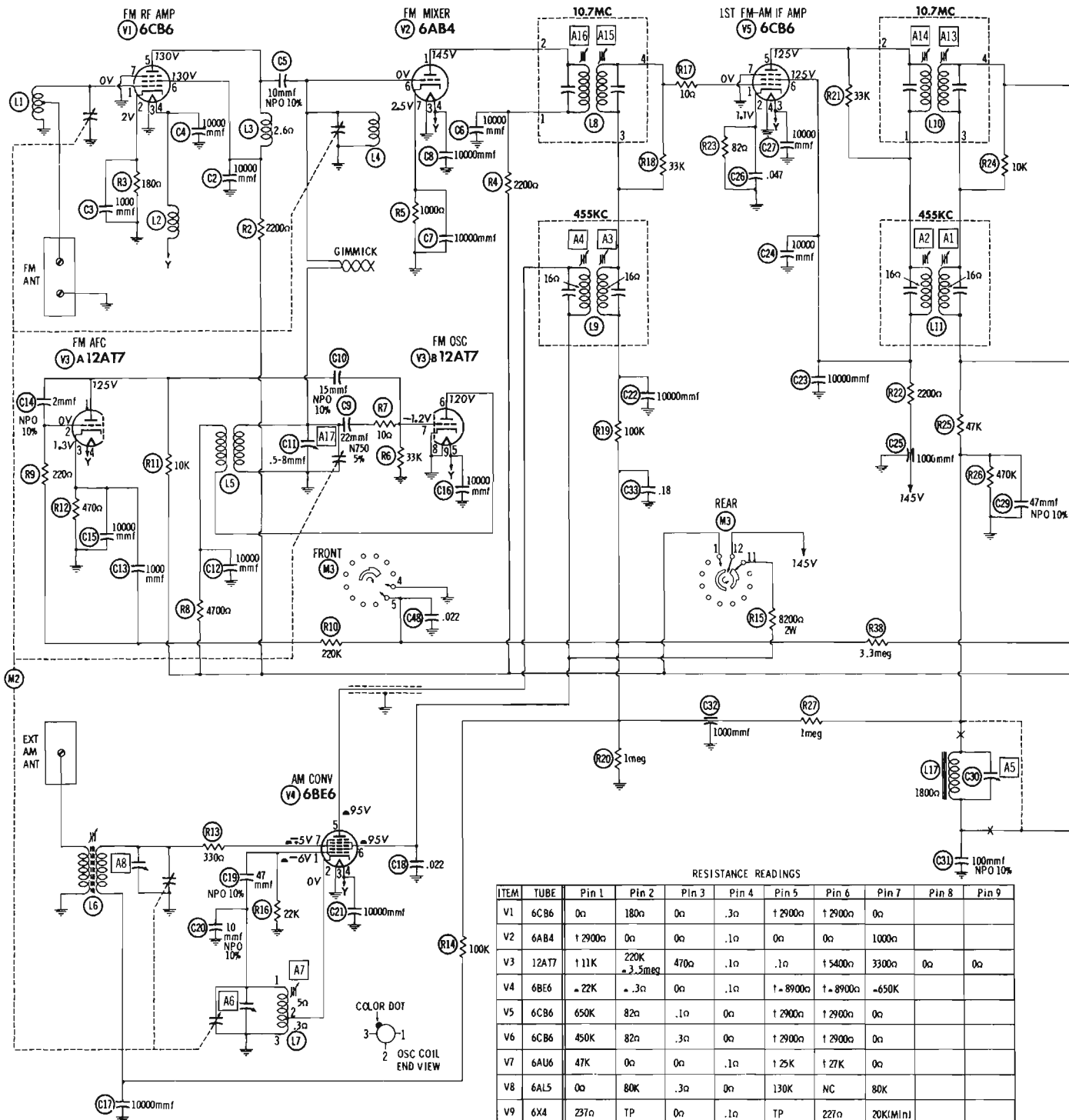
the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana. Printed in U.S. of America



CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



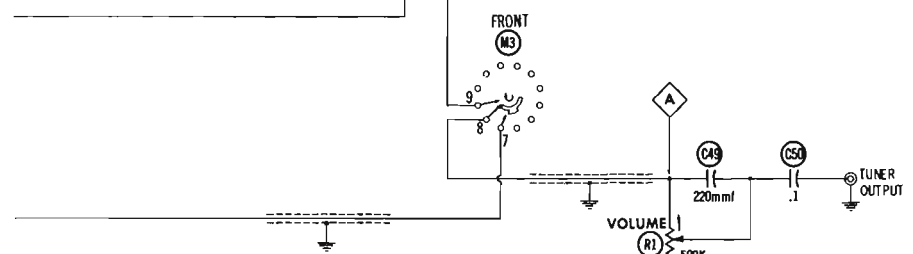
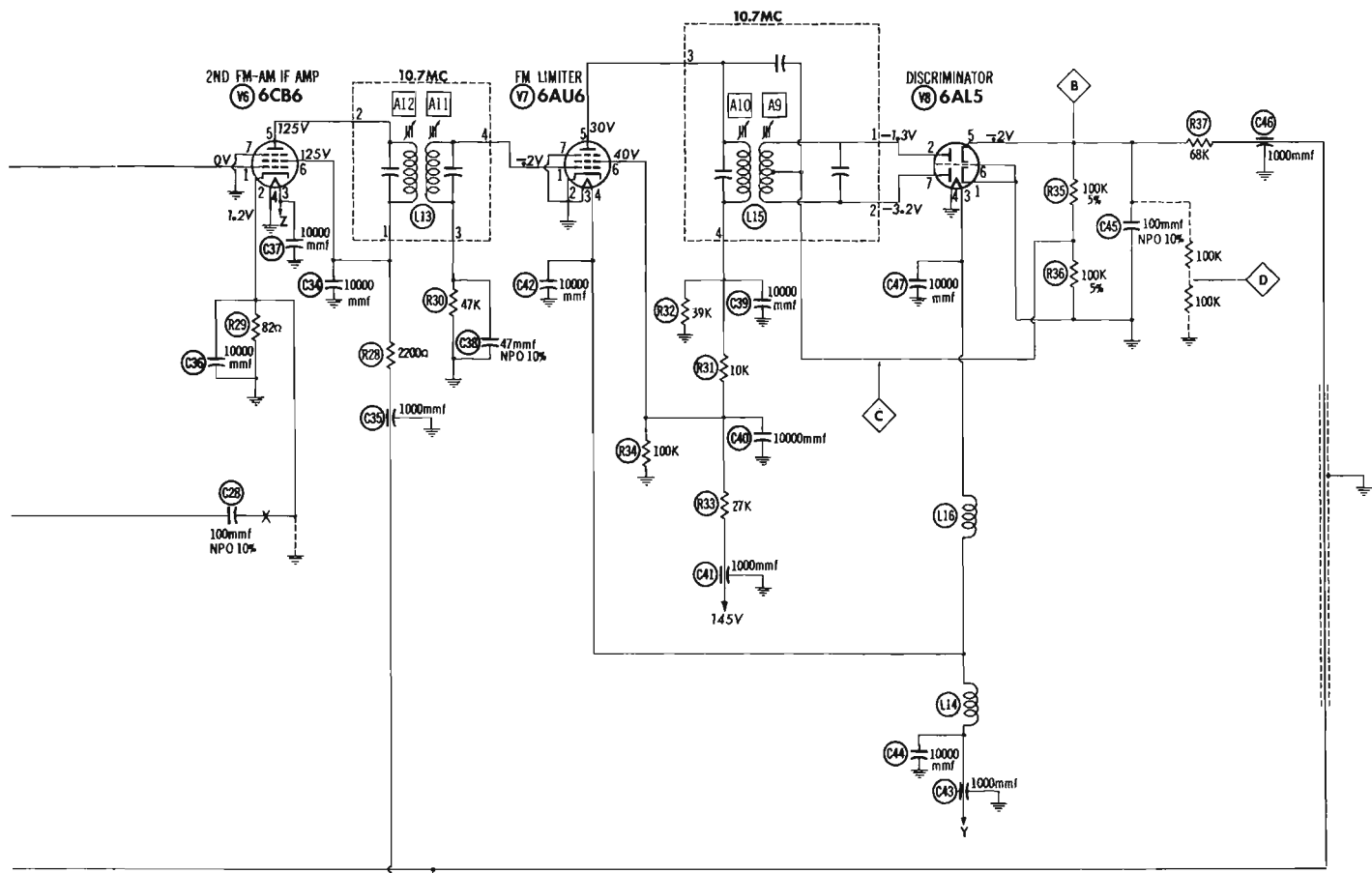
RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6CB6	0 $\Omega$	180 $\Omega$	0 $\Omega$	.3 $\Omega$	† 2900 $\Omega$	† 2900 $\Omega$	0 $\Omega$		
V2	6AB4	† 2900 $\Omega$	0 $\Omega$	0 $\Omega$	.1 $\Omega$	0 $\Omega$	0 $\Omega$	1000 $\Omega$		
V3	12AT7	111K	220K	470 $\Omega$	.1 $\Omega$	.1 $\Omega$	† 5400 $\Omega$	3300 $\Omega$	0 $\Omega$	0 $\Omega$
V4	6BE6	≈ 22K	≈ .3 $\Omega$	0 $\Omega$	.1 $\Omega$	† ≈ 8900 $\Omega$	† ≈ 8900 $\Omega$	≈ 650K		
V5	6CB6	650K	82 $\Omega$	.1 $\Omega$	0 $\Omega$	† 2900 $\Omega$	† 2900 $\Omega$	0 $\Omega$		
V6	6CB6	450K	82 $\Omega$	.3 $\Omega$	0 $\Omega$	† 2900 $\Omega$	† 2900 $\Omega$	0 $\Omega$		
V7	6AU6	47K	0 $\Omega$	0 $\Omega$	.1 $\Omega$	† 25K	† 27K	0 $\Omega$		
V8	6AL5	0 $\Omega$	80K	.3 $\Omega$	0 $\Omega$	130K	NC	80K		
V9	6X4	237 $\Omega$	TP	0 $\Omega$	.1 $\Omega$	TP	227 $\Omega$	20K(M/N)		

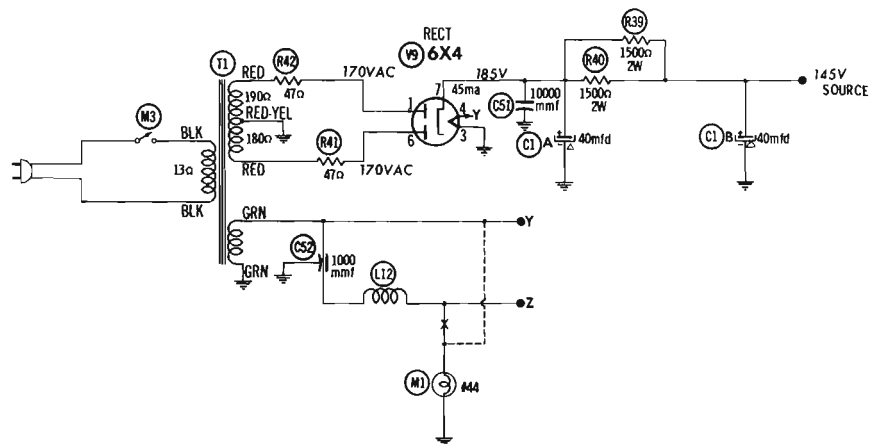
ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED  
 † MEASURED FROM PIN 7 OF V9  
 \* MEASURED IN "AM" POSITION  
 NC NO CONNECTION  
 TP TIE POINT

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION  
 DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM  
 ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±1% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.



SELECTOR SW (M3)  
SHOWN IN "OFF"  
POSITION  
SW SEQUENCE:  
1 - OFF  
2 - AM  
3 - FM-AFC  
4 - FM





# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .01mfd	High side to AM antenna stator lug of tuning gang. Low side to chassis.	455KC (400% Mod)	AM	Tuning gang fully open	DC probe to point (A). Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2. "	"	455KC (10KC Mod)	"	"	"	A5	Adjust for MINIMUM deflection.
3.	Loop	1800KC (400% Mod)	"	1800KC	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.	"	800KC	"	800KC	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. Repeat steps 3 and 4.
5.	"	1500KC	"	1500KC	"	A8	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
6. .01mfd	High side to pin 1 (grid) of 6AU6 (V7). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe to point (B). Common to chassis.	A9	Adjust for maximum deflection.
7. "	"	"	"	"	DC probe to point (C). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
8. "	High side to pin 6 (grid) of 6AB4 (V2). Low side to chassis.	"	"	"	DC probe to point (B). Common to chassis.	A11, A12, A13, A14, A15, A16	Adjust for maximum deflection.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
6. .01mfd	High side to pin 1 (grid) of 6AU6 (V7). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point (B). Low side to chassis.	A9	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1
7. "	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A10	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.
8. "	High side to pin 6 (grid) of 6AB4 (V2). Low side to chassis.	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A11, A12, A13, A14, A15, A16	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1

### FM RF ALIGNMENT

Step 11 is not necessary unless tuner fails to track properly.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9. 270Ω Carbon Resistor	High side thru 270Ω to FM Antenna terminal. Low side to chassis.	108MC (Unmod)	FM	108MC	DC probe to point (B). Common to chassis.	A17	Adjust for maximum deflection.
10. "	"	88MC	"	88MC	"	L4, L1	Adjust L4, L1 by compressing or expanding coil turns for maximum deflection.
11. "	"	108MC	"	108MC	"		Adjust for maximum deflection by bending FM RF and antenna rotor plates of tuning gang.

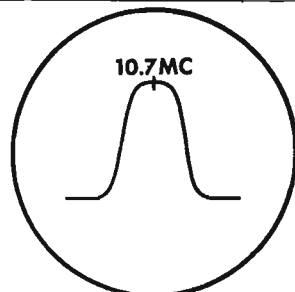


FIG. 1

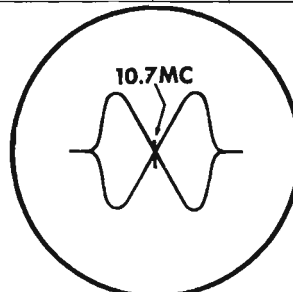


FIG. 2

## PARTS LIST AND DESCRIPTIONS TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6CB6		V6	2nd FM IF Amplifier - AM Del. - AVC	6CB6	
V2	FM Mixer	6AB4		V7	FM Limiter	6AU6	
V3	FM Osc. - FM AFC	12AT7		V8	Discriminator	6AL5	
V4	AM Converter	6BE6		V9	Rectifier	6X4	
V5	1st FM-AM IF Amplifier	6CB6					

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		KINGT PART No.	REPLACEMENT DATA					SANGAMO PART No.	SPRAGUE PART No.
	CAP.	VOLT.		AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.			
C1A	.40	300		AFB4-01-80	D0016	FP217.87			R2654 *	
C1B	.40	300								

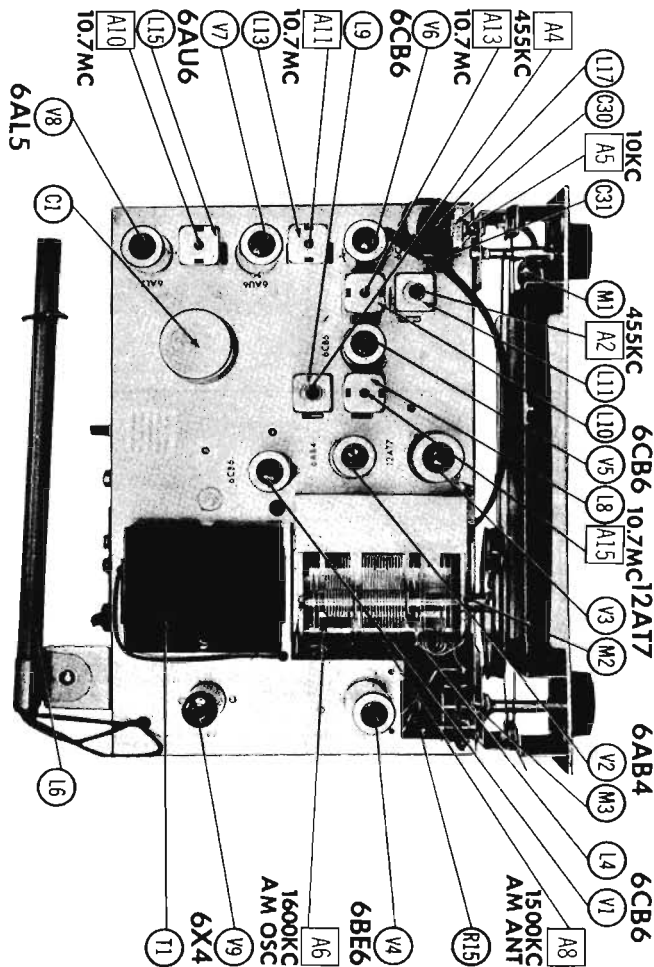
\* Non-Catalog Item

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		KINGT PART No.	REPLACEMENT DATA						NOTES
	CAP.	VOLT.		AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	SPRAGUE PART No.		
C2	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C3	1000			BPD-01	DD-102	BYA8D1	DC511	58K-D1		
C4	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C5	10			NPO-D1 10	DTZ-10	C10Q4C	ZT-541	5TCC-Q4	NPO	10%
C6	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C7	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C8	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C9	22			NPO-D1 22	DTZ-22	C10Q4C	DC511	58K-81		
C10	15			NPO-D1 15	DTZ-15	C10Q4C		5TCC-Q4B		
C11	5-8			BPD-01	DD-103	BYA1081	DC511	58K-81		
C12	10000			BPD-01	DD-102	BYA8D1	DC521	58K-D1		
C13	1000									
C14	3									
C15	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C16	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C17	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C18	222	200		P288N-222	DD-303	CUB4822	GEM-4122	2TM-822		
C19	47			NPO-D1 47	DTZ-47	C10Q47C		5TCC-Q47	NPO	10%
C20	10			NPO-D1 10	DTZ-10	C10Q4C	ZT-541	5TCC-Q4	NPO	10%
C21	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C22	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C23	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C24	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C25	1000	200		EF-001	MFT-1000			503C-D1		
C26	.947			P288N-947	DF-303	CUB3847	GEM-4147	2TM-847		
C27	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C28	100			NPO-D1 100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO	10%
C29	47			NPO-D1 47	DTZ-47	C10Q47C		5TCC-Q47	NPO	10%
C30										
C31	100	200		NPO-D1 100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO	10%
C32	100			EF-001	MFT-1000			503C-D1		
C33	.18									
C34	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C35	1000			EF-001	MFT-1000			503C-D1		
C36	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C37	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C38	47			NPO-D1 47	DTZ-47	C10Q47C		5TCC-Q47	NPO	10%
C39	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C40	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C41	1000			EF-001	MFT-1000			503C-D1		
C42	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C43	1000			EF-001	MFT-1000			503C-D1		
C44	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C45	100			NPO-D1 100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO	10%
C46	1000			EF-001	MFT-1000			503C-D1		
C47	10000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C48	222	200		P288N-222	DD-303	CUB4822	GEM-4122	2TM-822		
C49	.947			DI 230	DD-221	LVT22	UC-5322	50A-T22		
C50	1			P288N-1	DF-104	CUB291	GEM-201	2TM-1		
C51	1000			BPD-01	DD-103	BYA1081	DC511	58K-81		
C52	10000			EF-001	MFT-1000			503C-D1		

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued) CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	KNIGHT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
RLA B	500K Shaft	1	RP-504A-F-B	AB-80 AK-1	A47-500K-Z* FEB-1/4	BLI-183 TM2-KU	TAS5A Not Req.	Volume

\* Enlarge mounting hole to 3/8" diameter.

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		KNIGHT PART No.	NOTES	ITEM No.	RATING		KNIGHT PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R2	2200Ω				R23	82Ω			
R3	160Ω				R24	10K			
R4	2200Ω				R25	47K			
R5	100Ω				R26	470K			
R6	33K				R27	1meg			
R7	10Ω				R28	2200Ω			
R8	4700Ω				R29	82Ω			
R9	220Ω				R30	47K			
R10	220K				R31	10K			
R11	10K				R32	39K			
R12	470Ω				R33	27K			
R13	330Ω				R34	100K			
R14	100K				R35	100K 5%			
R15	8200Ω	2			R36	100K 5%			
R16	22K				R37	88K			
R17	10Ω				R38	3.3meg			
R18	33K				R39	1500Ω	2		
R19	100K				R40	1500Ω	2		
R20	1meg				R41	47Ω			
R21	33K				R42	47Ω			
R22	2200Ω								

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	KNIGHT PART No.	Hollandson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ⊙ .38A	355VCT ⊙ .043A	6.3V ⊙ 2.9A	LP-0245						

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		KNIGHT PART No.	Meissner PART No.	Mayr PART No.	Atlier PART No.	Rom PART No.	
L1	FM Antenna Coil	LL-0061					
L2	FL Choke		10-1007	BC-560	4590		.68 Microhenry ⊕ 3.3 Microhenries ⊕
L3	RF Choke						
L4	FM RF Coil	LL-0060					
L5	FM Osc. Coil	LL-0062					
L6	Loop Stick	LW-0109					
L7	AM Osc. Coil	LL-0059			70-Osc.*		* Disregard primary
L8	1st FM IF	LR-0032	16-3487	FM-254	1463		
L9	1st AM IF	LR-0041	16-8770	BC-352	12-C1	RF-1	
L10	2nd FM IF	LR-0033	16-3487	FM-254	1463		
L11	2nd AM IF	LR-0041	16-8770	BC-352	12-C2	RF-2	
L12	FL Choke		19-1007	BC-560	4590		.68 Microhenry ⊕
L13	3rd FM IF	LR-0033	16-3487	FM-254	1463		
L14	FL Choke		19-1007	BC-560	4590		.68 Microhenry ⊕
L15	Discriminator		17-3494	FM-253	1464		
L16	FL Choke	LQ-0179	19-1007	BC-560	4590		.68 Microhenry ⊕

⊕ IRC Part #CLA.

## PARTS LIST AND DESCRIPTIONS (Continued) FILTER CHOKE

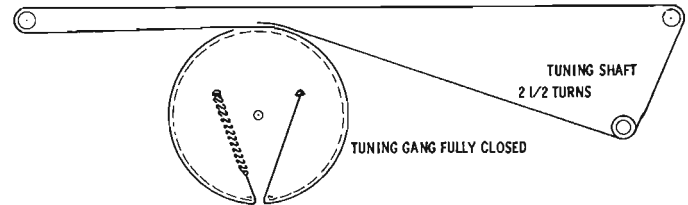
ITEM No.	RATINGS		REPLACEMENT DATA							
	CURRENT (Measured)	DC RES.	INDUCTANCE (D CURRENT 1000 $\mu$ )	KNIGHT PART No.	Hollandson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L17		1800Ω	2.7 Hys.	LC-0232						

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Lamp		#44
M2	Tuning Cap.		AM-FM (AM Sections: Ant. 12-432mmf, Osc. 8-152mmf)
M3	Switch	X-0312-B	Function (Four position, Single section, Rotary wafers)

### WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8630 (Solid) Available in Ten Colors  
6524 (Stranded) Available in Ten Colors  
Power Cord ..... Use BELDEN No. 1785-B (6 Ft. Length)  
1726-K (7 1/2 Ft. Length)



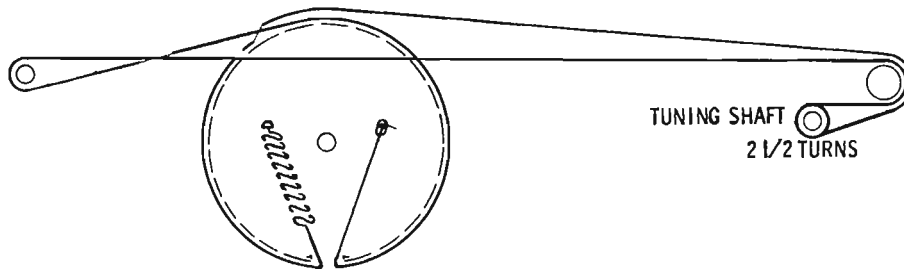
### DIAL CORD STRINGING



KNIGHT MODEL  
KN-110 (92SX403)

TRADE NAME	Knight Model KN-110 (92SX403)		
SUPPLIER	Allied Radio Corp., 100N. Western Ave., Chicago 80, Illinois		
TYPE SET	AC Operated FM-AM Tuner		
TUBES	Twelve		
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING	.5 Amp. @117 Volts AC (47 Watts)
TUNING RANGE—BROADCAST	540-1620KC	FRED. MOD.	88-108MC

FM AM DIAL CORD  
TUNING GANG FULLY CLOSED

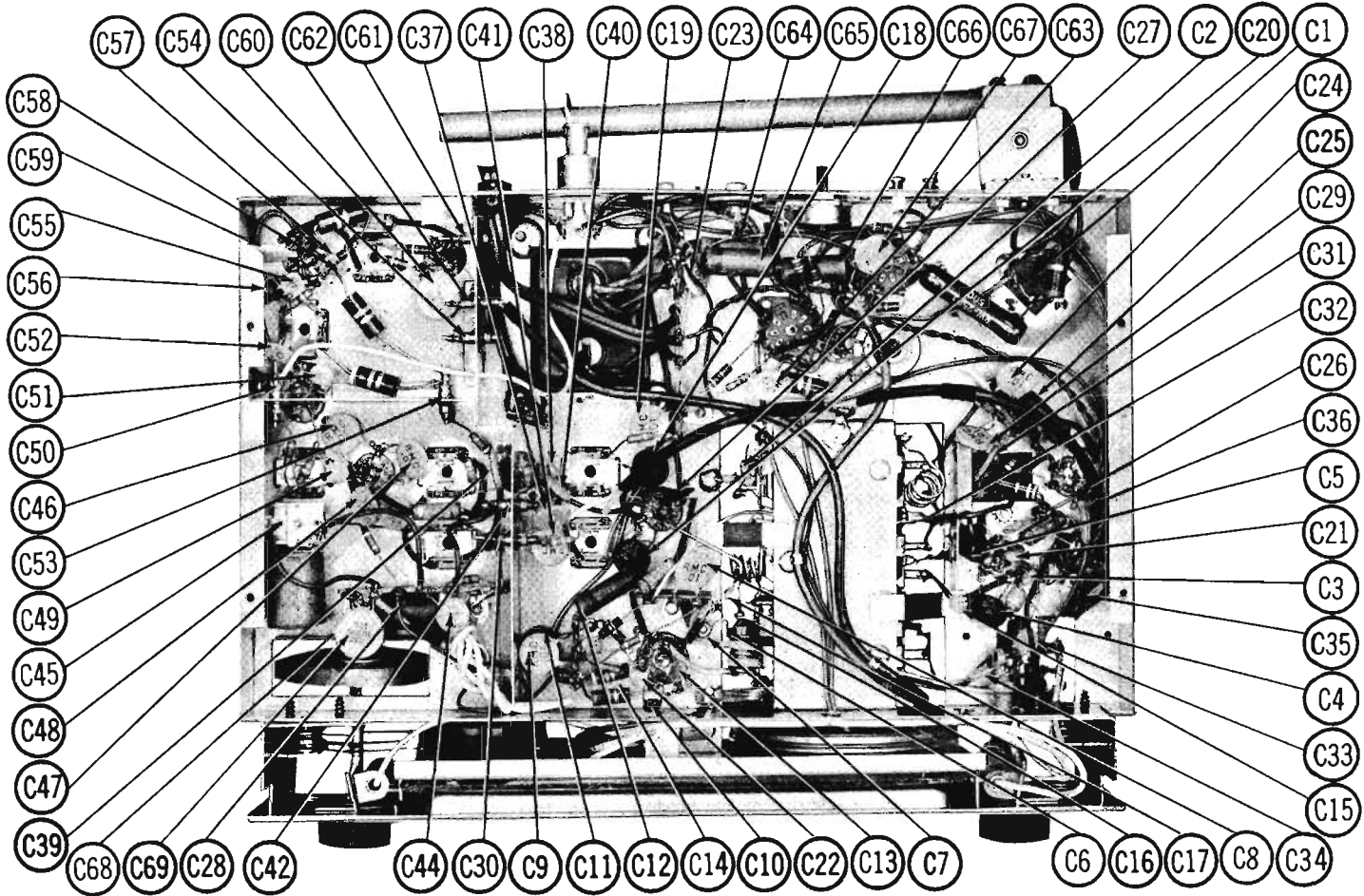


DIAL CORD STRINGING

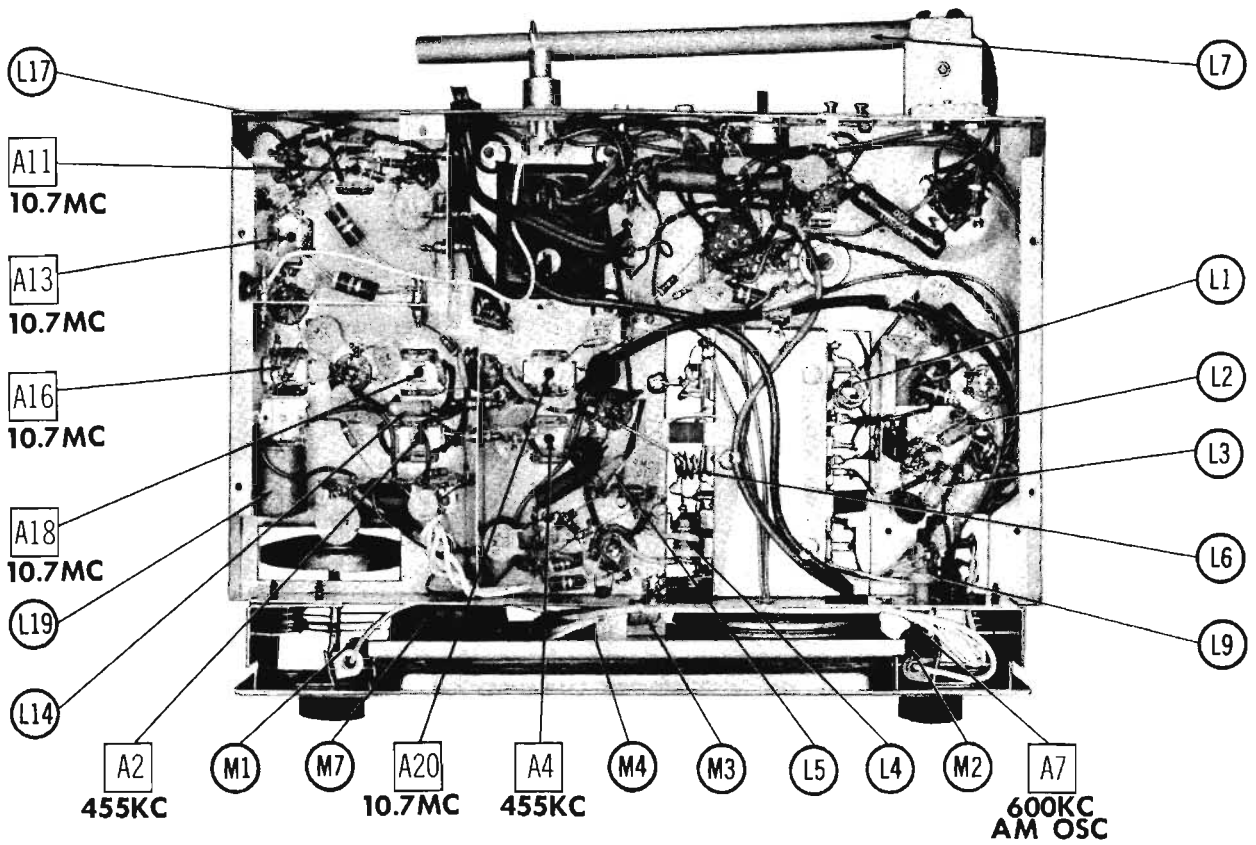
HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H452

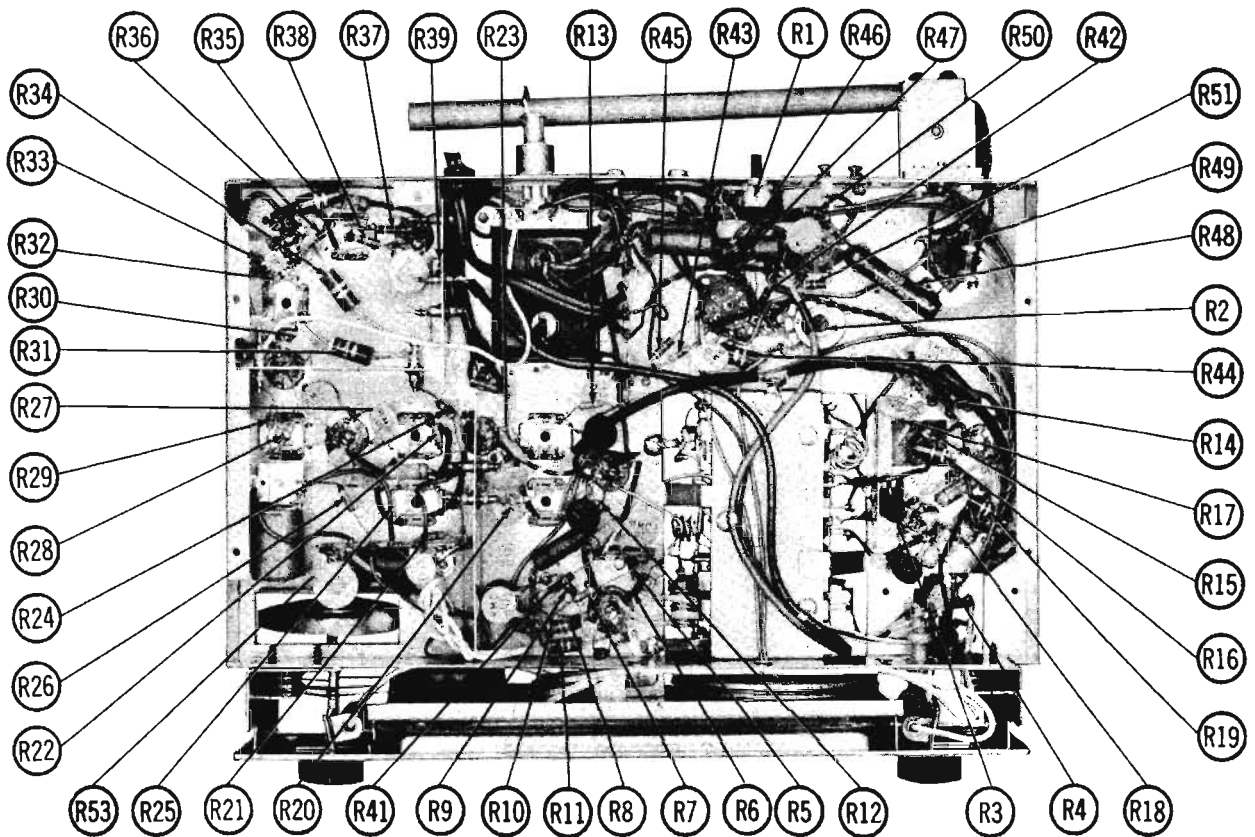
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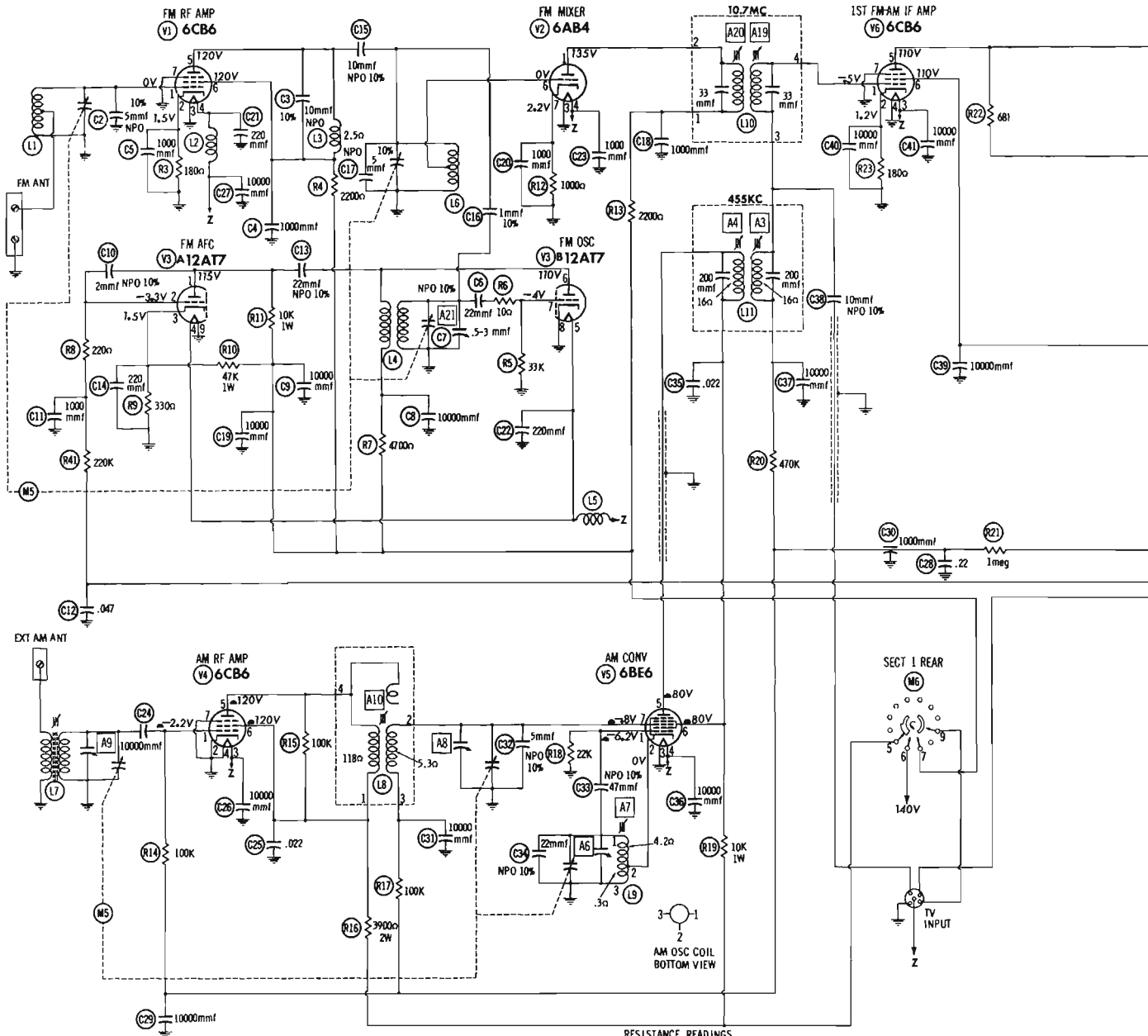
CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS BOTTOM VIEW-ALIGN, INDUCTOR & MISC. IDENT.



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

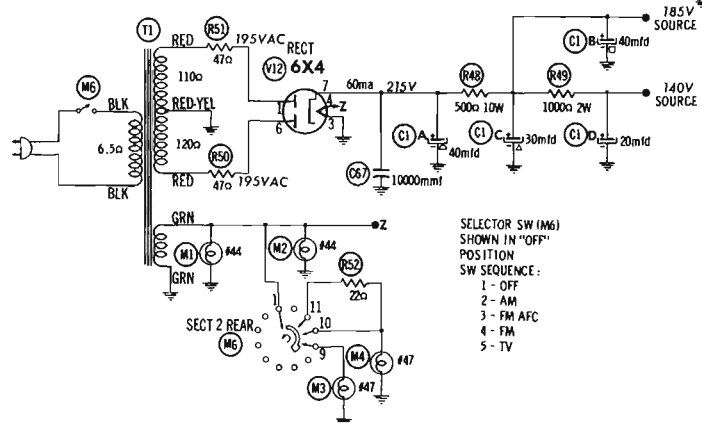
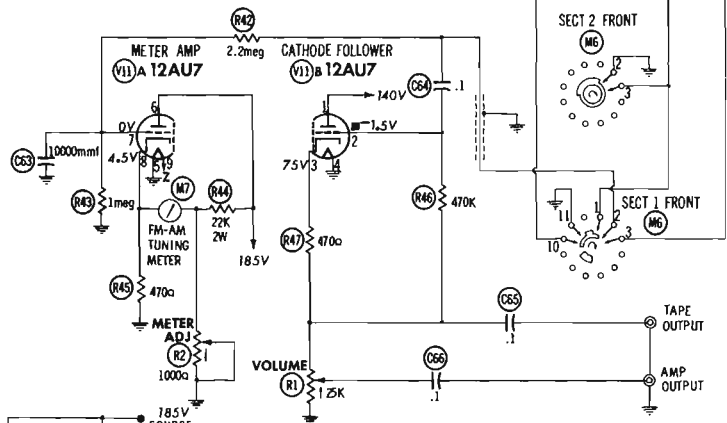
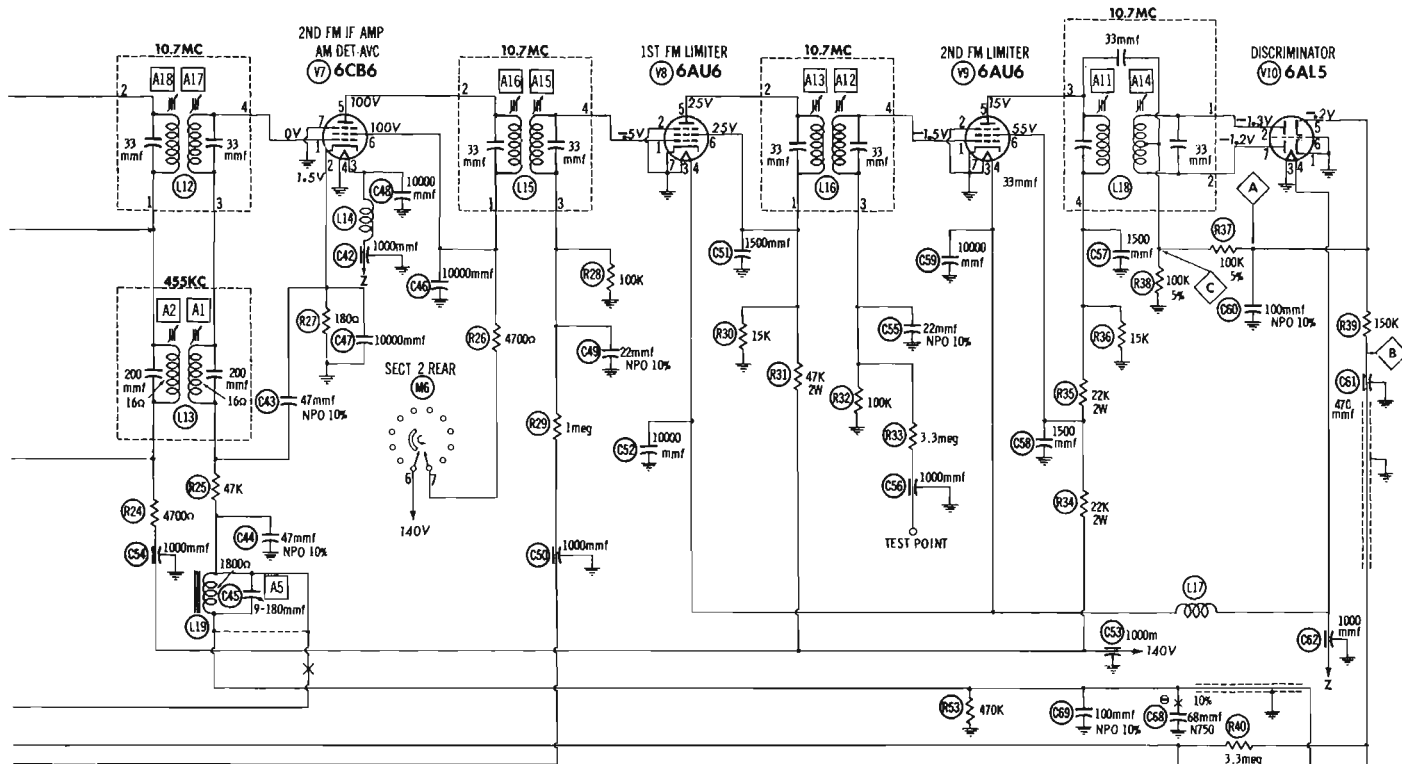


RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6CB6	0 $\Omega$	180 $\Omega$	0 $\Omega$	.3 $\Omega$	13700 $\Omega$	13700 $\Omega$	0 $\Omega$		
V2	6AB4	13700 $\Omega$	0 $\Omega$	0 $\Omega$	.1 $\Omega$	0 $\Omega$	0 $\Omega$	1000 $\Omega$		
V3	12AT7	11K	3.8meg	330 $\Omega$	.2 $\Omega$	.2 $\Omega$	16200 $\Omega$	33K	0 $\Omega$	0 $\Omega$
V4	6CB6	1.4meg	0 $\Omega$	.1 $\Omega$	0 $\Omega$	1-5400 $\Omega$	1-5400 $\Omega$	0 $\Omega$		
V5	6BE6	22K	.3 $\Omega$	0 $\Omega$	.1 $\Omega$	1-11K	1-11K	1.4meg		
V6	6CB6	1.4meg	180 $\Omega$	.1 $\Omega$	0 $\Omega$	16200 $\Omega$	16200 $\Omega$	0 $\Omega$		
V7	6CB6	47K	180 $\Omega$	.2 $\Omega$	0 $\Omega$	16200 $\Omega$	16200 $\Omega$	0 $\Omega$		
V8	6AU6	100K	0 $\Omega$	0 $\Omega$	.1 $\Omega$	148K	148K	0 $\Omega$		
V9	6AU6	100K	0 $\Omega$	0 $\Omega$	.1 $\Omega$	117K	116K	0 $\Omega$		
V10	6AL5	0 $\Omega$	100K	0 $\Omega$	.1 $\Omega$	200K	0 $\Omega$	100K		
V11	12AU7	1500 $\Omega$	490K	25K	0 $\Omega$	0 $\Omega$	1500 $\Omega$	650K	300 $\Omega$	.1 $\Omega$
V12	6X4	157 $\Omega$	TP	0 $\Omega$	.1 $\Omega$	TP	167 $\Omega$	20K(MIN)		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED  
 1 MEASURED FROM PIN 7 OF V12  
 - MEASURED IN "AM" POSITION  
 ■ MEASURED FROM PIN 3 OF V11  
 TP TIE POINT

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION  
 DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM  
 ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.



# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .1mf	High side to pin 7 (grid) of 6BE6 (V5). Low side to chassis.	455KC (400% Mod)	AM	Point of non-interference.	AC probe to amplifier output jack Common to chassis.	A1, A2, A3, A4,	Adjust for maximum deflection.
2. "	"	455KC (10KC Mod)	"	"	"	A5	Adjust for MINIMUM deflection
3.	Loop	1600KC (400% Mod)	"	1600KC	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.	"	600KC	"	Tune for 600KC signal.	"	A7	"
5.	"	1500KC	"	1500KC	"	A8, A9	"
6.	"	600KC	"	600KC	"	A10	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. Repeat steps 3, 4, 5, and 6.

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7. .01mf	High side to pin 1 (grid) of 6AU6 (V8). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference.	DC probe to point $\odot$ . Common to chassis.	A11, A12, A13	Adjust for maximum deflection.
8. "	"	"	"	"	DC probe to point $\ominus$ . Common to chassis.	A14	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
9. "	High side to FM RF stator lug of tuning gang. Low side to chassis.	"	"	"	DC probe to point $\odot$ . Common to chassis.	A15, A16, A17, A18, A19, A20	Adjust for maximum deflection.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
7. .01mf	High side to pin 1 (grid) of 6AU6 (V8). Low side to chassis.	10.7MC (450KC. 8WP)	FM	Point of non-interference	Vert. Amp. thru 27K to point $\odot$ . Low side to chassis.	A11, A12, A13	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1
8. "	"	"	"	"	Vert. Amp. to point $\Delta$ . Low side to chassis.	A14	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2 SLIGHTLY retouch A 11 for maximum amplitude and straightness of crossover lines.
9. "	High side to FM RF stator lug of tuning gang. Low side to chassis.	"	"	"	Vert. Amp. thru 27K to point $\odot$ . Low side to chassis	A15, A16, A17, A18, A19, A20	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1

### FM RF ALIGNMENT

Steps 11 and 12 are not necessary unless the receiver fails to track properly.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
10. 270 $\Omega$ Carbon Resistor	High side thru 270 $\Omega$ to FM Ant. terminal. Low side to chassis.	108MC	FM	108MC	DC probe to point $\odot$ . Common to chassis.	A21	Adjust for maximum deflection.
11. "	"	106MC	"	106MC	"		Adjust for maximum deflection by bending FM RF rotor plates of tuning gang.
12. "	"	88MC	"	88MC	"	L4	Adjust by compressing or expanding coil turns for maximum deflection while rocking tuning gang

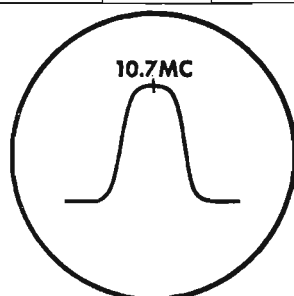


FIG. 1

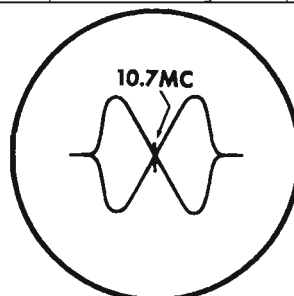


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES ( GENERAL ELECTRIC, SYLVANIA )

ITEM No.	USE	TYPE	ITEM No.	USE	TYPE
V1	FM-RF Amplifier	6CB6	V7	2nd FM IF Amp. -AM Det. -AVC	6CB6
V2	FM Mixer	6AB4	V8	1st FM Limiter	6A08
V3	FM Osc. -FM AFC	12A17	V9	2nd FM Limiter	6A08
V4	AM RF Amplifier	6CB6	V10	Disc Eliminator	6A15
V5	AM Converter	6BE6	V11	Cath. Follower-Meter Amp.	12A17
V6	1st. FM-AM IF Amplifier	6CB6	V12	Rectifier	6X4

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CLA	40	300			D0032	FP420.35	TMQ-3	D-130	R2386*
B	40	300			BR4035	TC78	TD-20-250	MTD-3520	
C	30	250							
D	20	200							

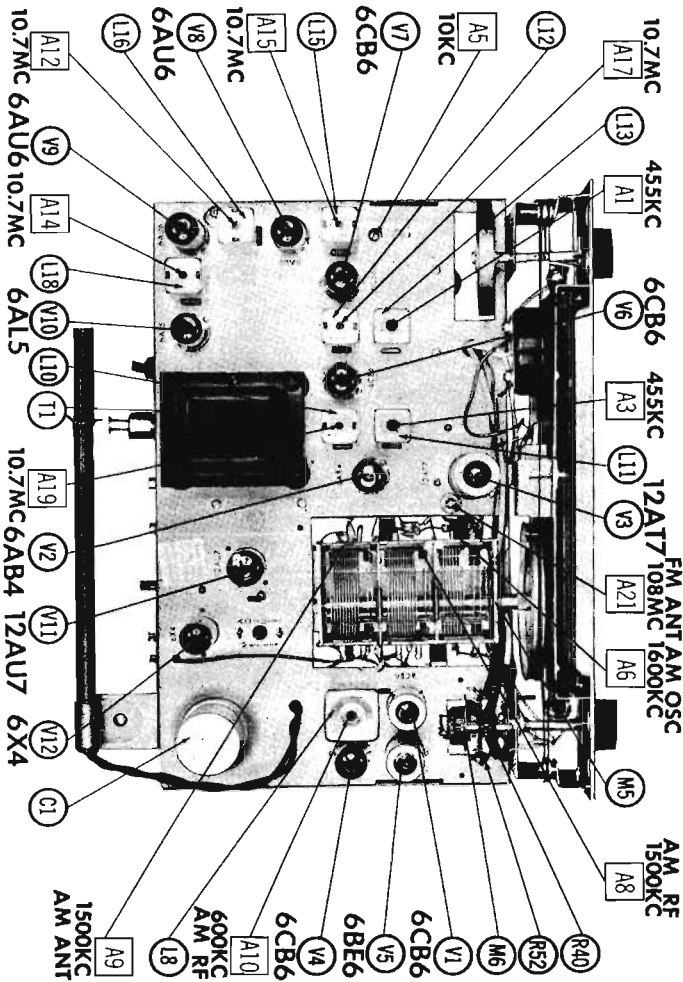
\* Non Catalog Item

### FIXED CAPACITORS

Capacitor values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	SPRAGUE PART No.	
C2	5	10	NPO-D15	DTZ-4R7	C10V5C	ZT-555	5TCCB-V5	NPO 10%	
C4	1000		NPO-D10	DTZ-10	C10Q1C	ZT-541	5TCC-Q1	NPO 10%	
C5	1000		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C6	22		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C7	22		NPO-D122	DTZ-22	C10Q22C		5TCC-Q22	NPO 10%	
C8	10000		BPD-01	DD-103	BYA6B1	CT565A	5BK-S1		
C9	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C10	3		NPO-D12.2	DTZ-2R2	C10V22C	DC511	5TCCB-V22	NPO 10%	
C11	1000		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C12	.047		P288N-047	DF-503	CUB2847	GEM-4147	27M-847		
C13	22		NPO-D122	DTZ-22	C10Q22C		5TCC-Q22	NPO 10%	
C14	220		BPD-00022	DD-221	L40T22	UC-5322	5GA-T22		
C15	10		NPO-D110	DTZ-10	C10Q1C	ZT-541	5TCC-Q1	NPO 10%	
C16	1							NPO 10%	
C17	5		NPO-D15	DTZ-4R7	C10V5C	ZT-555	5TCCB-V5		
C18	1000		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C19	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C20	1000		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C21	220		BPD-00022	DD-221	L40T22	UC-5322	5GA-T22		
C22	220		BPD-00022	DD-221	L40T22	UC-5322	5GA-T22		
C23	1000		BPD-001	DD-102	BYA6D1	DC521	5BK-D1		
C24	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C25	.022		P288N-022	DD-203	CUB2822	GEM-4122	47M-822		
C26	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C27	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C28	.22		P288N-22	CUB2822		GEM-2022	27M-P22		
C29	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C30	1000		EF-001	MFT-1000			503C-D1		
C31	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C32	5		NPO-D15	DTZ-4R7	C10V5C	ZT-555	5TCCB-V5	NPO 10%	
C33	47		NPO-D147	DTZ-47	C10Q47C	ZT-5447	5TCC-Q47	NPO 10%	
C34	22		NPO-D122	DTZ-22	C10Q22C		5TCC-Q22	NPO 10%	
C35	.022		P288N-022	DD-203	CUB2822	GEM-4122	47M-822		
C36	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C37	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C38	10		NPO-D110	DTZ-10	C10Q1C	ZT-541	5TCC-Q1	NPO 10%	
C39	1000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C40	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C41	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C42	1000		EF-001	MFT-1000			503C-D1		
C43	47		NPO-D147	DTZ-47	C10Q47C	ZT-5447	5TCC-Q47	NPO 10%	
C44	47		NPO-D147	DTZ-47	C10Q47C	ZT-5447	5TCC-Q47	NPO 10%	
C45	9-180								
C46	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C47	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		
C48	10000		BPD-01	DD-103	BYA6B1	DC511	5BK-S1		

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

## CAPACITORS (cont)

ITEM No.	RATING		KNIGHT PART No.	REPLACEMENT DATA						NOTES
	CAP.	VOLT		AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C49	22			NPO-D182	DTZ-22	C10Q22C		5TCC-Q22	NPO 10%	
C50	1000			EF-001	MFT-1000		503C-D1	503C-D1		
C51	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15		
C52	10000			BPD-01	DD-103	BYA681	DC511	5HK-S1		
C53	1000			EF-001	MFT-1000		503C-D1	503C-D1		
C54	1000			EF-001	MFT-1000		503C-D1	503C-D1		
C55	22			NPO-D122	DTZ-22	C10Q22C		5TCC-Q22	NPO 10%	
C56	1000			EF-001	MFT-1000		503C-D1	503C-D1		
C57	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15		
C58	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15		
C59	10000			BPD-01	DD-103	BYA681	DC611	5HK-S1		
C60	100			NPO-D1100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO 10%	
C61	470									
C62	1000			EF-001	MFT-1000		503C-D1	503C-D1		
C63	10000			BPD-01	DD-103	BYA681	DC511	5HK-S1		
C64	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1		
C65	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1		
C66	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1		
C67	10000			BPD-01	DD-103	BYA681	DC511	5HK-S1		
C68	68			N750-D168	DTN-68	C10Q68U		5TCU-Q68	N750 10% ①	
C69	100			NPO-D1100	DTZ-100	C10T1C	ZT-531	5TCC-T1	NPO 10%	

① Not used in some versions.

## CONTROLS

ITEM No.	RATING		KNIGHT PART No.	REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS		CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	25K	↓	RP-255B	AB-29 *		B13-130	U18A *	Volume	
R1B	5K	↓	RP-255B	AK-1		TM2-K1t	Not Req.		
R2A	10000	↓	RP-102C	AB-5*	A47-1000-S*	B13-108	TA13L	Meter Adjust	
R2B	10000	↓	RP-102C	AK-1	FES-1/4	TM2-K1t	Not Req.		

\* Enlarge mounting hole to 3/8"

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		KNIGHT PART No.	NOTES	ITEM No.	RATING		KNIGHT PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R3	1800				R29	1meg			
R4	22000				R30	15K			
R5	33K				R31	47K	2		
R6	100				R32	100K			
R7	47000				R33	3.3meg			
R8	2200				R34	22K	2		
R9	3300				R35	22K	2		
R10	47K	1			R36	15K			
R11	10K	1			R37	100K 5%			
R12	10000				R38	100K 5%			
R13	22000				R39	150K			
R14	100K				R40	3.3meg			
R15	100K				R41	220K			
R16	10000				R42	2.2meg			
R17	100K				R43	1meg			
R18	22K				R44	22K	2		
R19	10K	1			R45	4700			
R20	470K				R46	470K			
R21	1meg				R47	4700			
R22	68K				R48	5000	10		
R23	1800				R49	10000	2		
R24	47000				R50	470			
R25	47K				R51	470			
R26	47000				R52	220			
R27	1800				R53	470K			
R28	100K								

## PARTS LIST AND DESCRIPTIONS (Continued)

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRV	SEC 1	SEC 2	KNIGHT PART No.	Haldarson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	115V @ .5A	250VCT @ .059A	250V @ 4.3A	LP-0244B						

## COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						NOTES
		KNIGHT PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.		
L1	FM Ant. Coil	LW-0106						
L2	Fl. Choke		19-1007	BC-560	4590		.68 Microhenry ↑	
L3	RF Choke						3.3 Microhenries ↑	
L4	FM Osc.	LI-0050	19-1007	BC-560	4590		.68 Microhenry ↑	
L5	Fl. Choke							
L6	FM Mixer Coil	LW-0105						
L7	Loop Stick	LW-0109						
L8	AM RF Trans.	LW-0074						
L9	AM Osc. Coil	LL-0049				70-Osc*		
L10	1st FM IF	LR-0032	16-3487	FM-254	1463			
L11	1st AM IF	LR-0041	16-3487	BC-352	12-C1	RF-1		
L12	2nd FM IF	LR-0043	16-3487	FM-254	1463			
L13	2nd AM IF	LR-0041	16-0770	BC-353	12-C2	RF-2		
L14	Fl. Choke		19-1007	BC-560	4590		.68 Microhenry ↑	
L15	3rd FM IF	LR-0043	16-3487	FM-254	1463			
L16	FM Limiter	LR-0043	16-3487	FM-254	1463			
L17	Fl. Choke		19-1007	BC-560	4590		.68 Microhenry ↑	
L18	Discriminator	LQ-0179	17-3494	FM-253	1464			

\* Disregard Primary

↑ IRC Part #CLA

## FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE 10 CURRENT (1000 A)	KNIGHT PART No.	Haldarson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
L19		1800Ω	2.7H							

## MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Dial Lamp		444
M2	Dial Lamp		444
M3	Lamp		447 AM Indicator
M4	Lamp		447 FM Indicator
M5	Tuning, Cap.	CV-102	5 Gang, FM-AM Function, 2 Section, Rotary Wafer Type, with Power On-Off, 8PBT, FM-AM Tuning
M6	Switch		
M7	Meter		

## WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors  
8524 (Stranded) Available in Ten Colors  
Power Cord ..... Use BELDEN No. 1785-B (6 Ft. Length)  
1725-K (7 1/2 Ft. Length)



TRADE NAME	Knight Model KN-410 (92SX408)		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois		
TYPE SET	AC Operated TV Sound Tuner		
TUBES (Six)	Types 6CY5 RF Amplifier, 6CL8 Mixer-Oscillator, 6CB6 1st. IF Amplifier, 6CB6 2nd. IF Amplifier, 6AL5 Ratio Detector, 6X4 Rectifier		
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING	.3 Amp. @ 117 Volts AC (29 Watts)
TUNING RANGE	VHF Channels 2 thru 13		

KNIGHT  
MODEL KN-410 (92SX408)

## ALIGNMENT INSTRUCTIONS

### OSCILLATOR ALIGNMENT

Touch-up adjustment of the VHF Oscillator is possible by removing the Channel Selector and Fine Tuning knobs. Set the Fine Tuning at the center of its range. One slug for HIGH band adjustment is located at 4 o'clock, and should be adjusted first. The LOW band adjustment is located at 9 o'clock. Adjust for best sound.

### RF AND MIXER ALIGNMENT

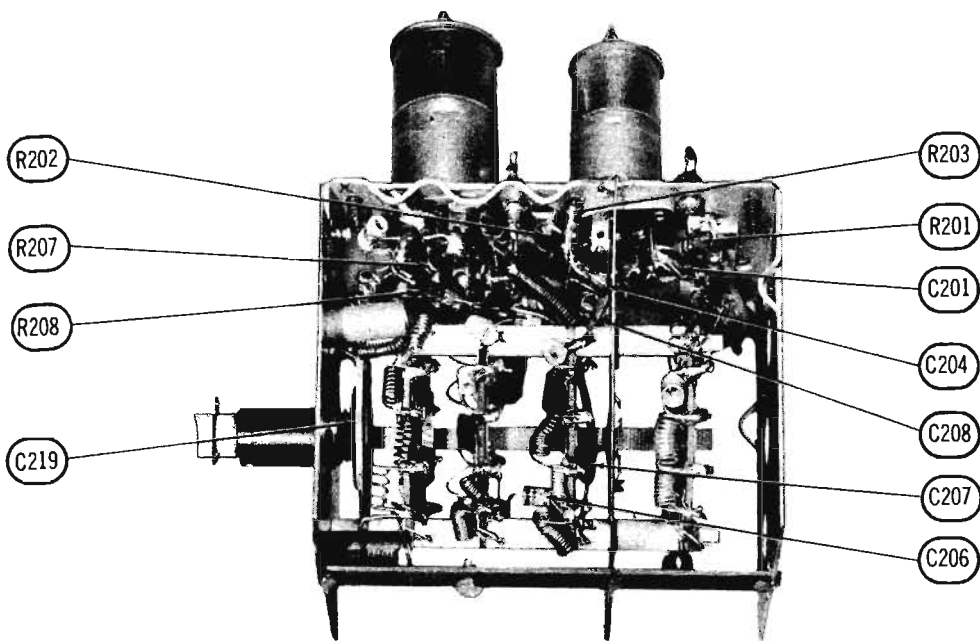
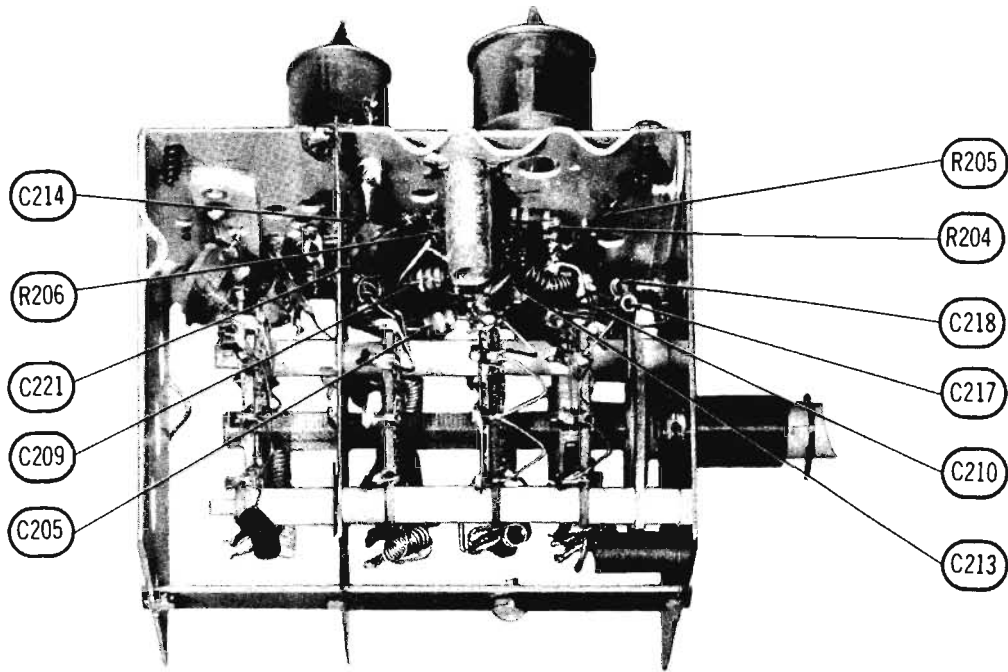
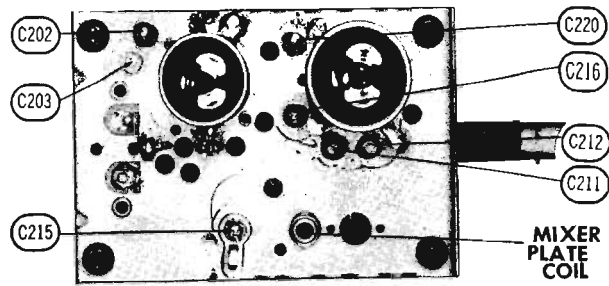
This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	.001mfd	High side to point $\diamond$ . Low side to chassis.	21.9MC	Any non-interfering channel	DC probe to point $\diamond$ . Common to chassis. Use negative scale.	A1, A2, A3	Use only enough generator output to provide a usable indication on VTVM. Adjust for maximum deflection.
2.	"	"	"	"	DC probe to point $\diamond$ . Common to chassis.	A4	Increase generator output. Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

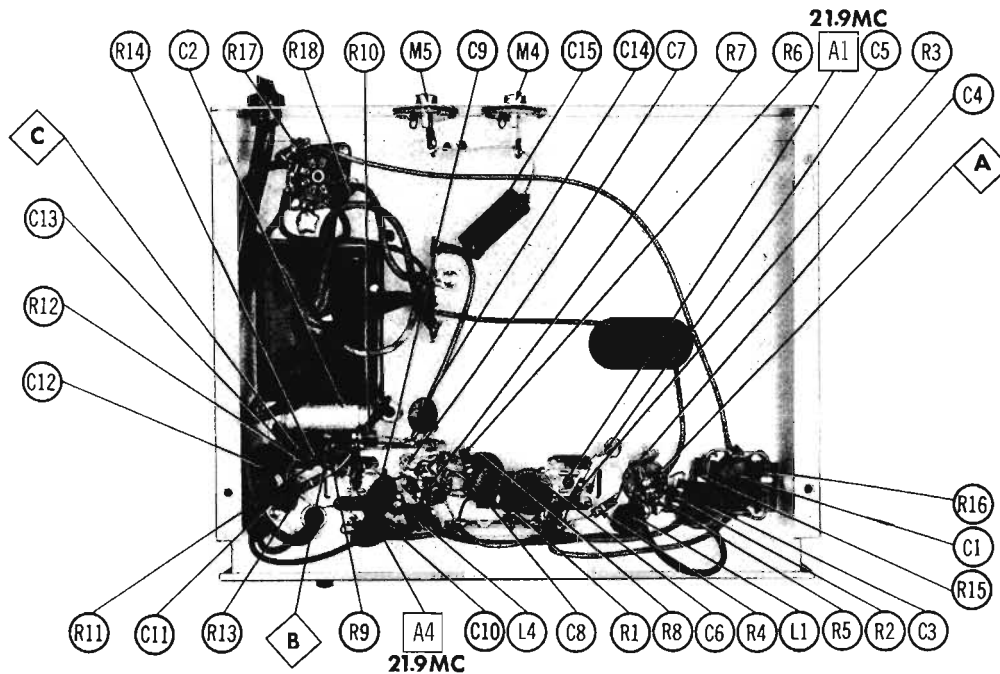
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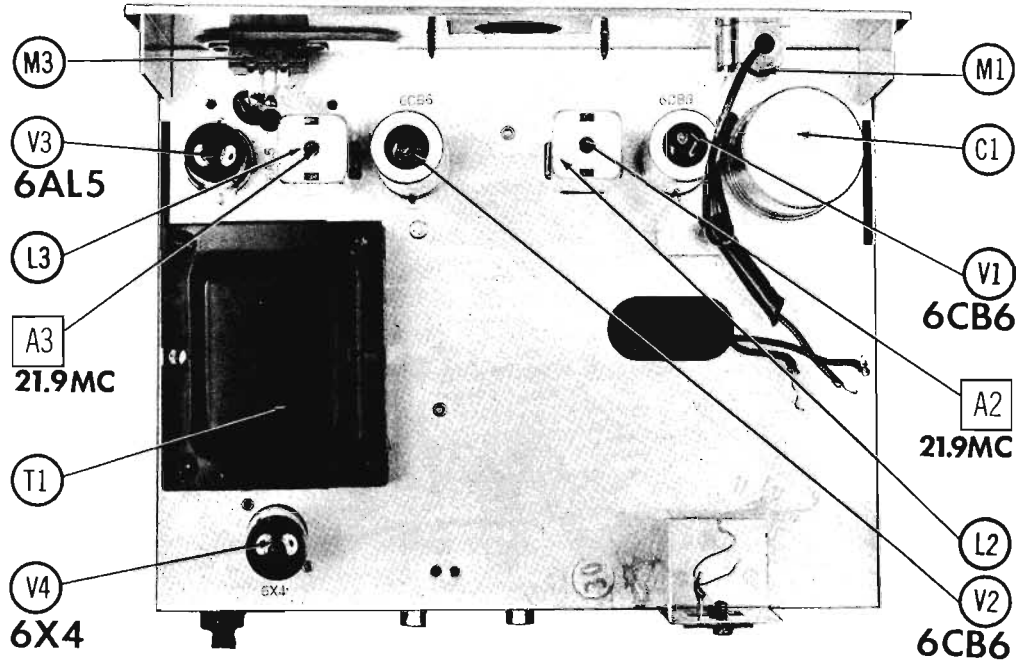
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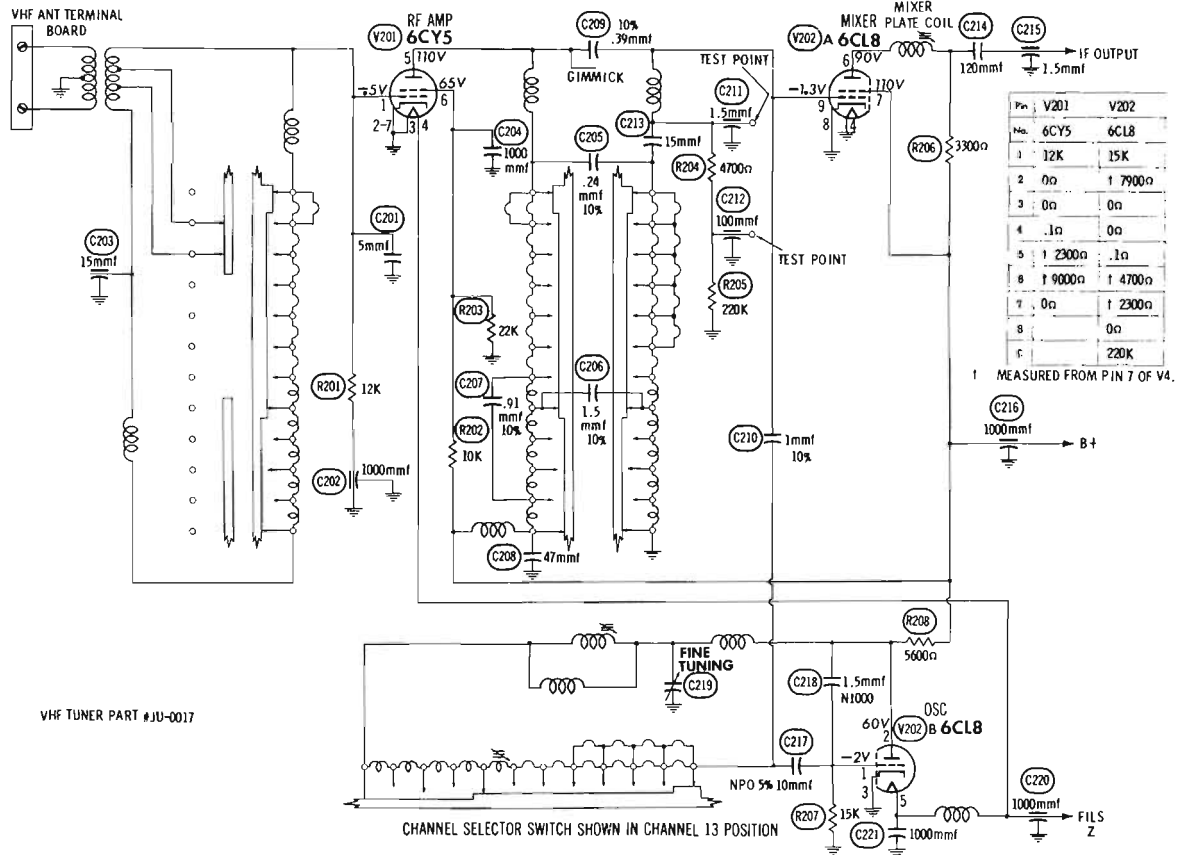
RF TUNER



IF-POWER CHASSIS - BOTTOM VIEW

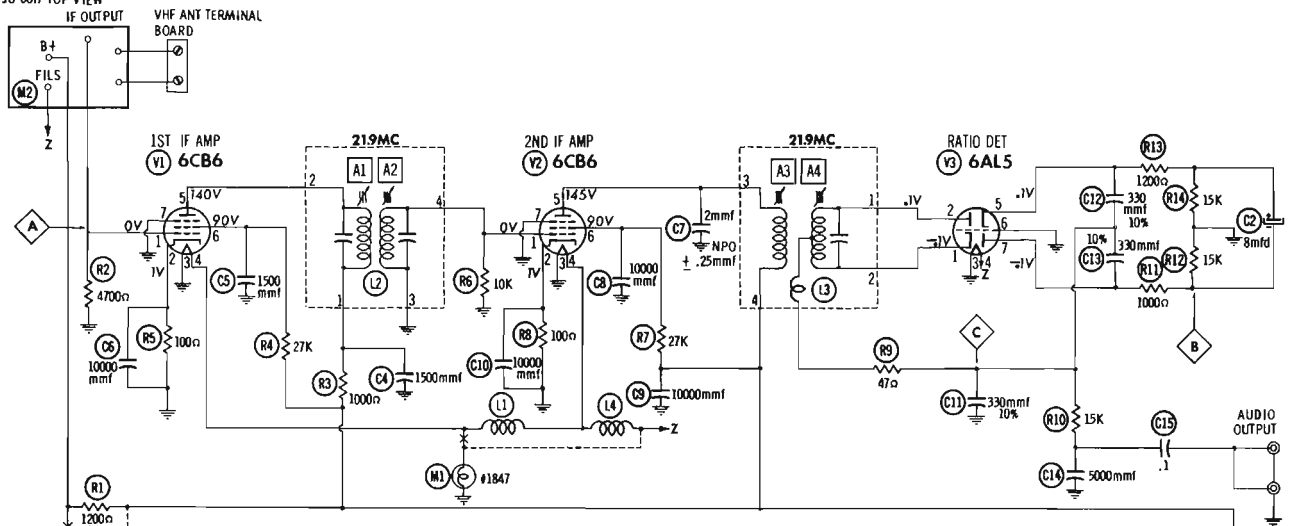


IF-POWER CHASSIS - TOP VIEW



## RF TUNER SCHEMATIC

VHF TUNER PART #JU-0017 TOP VIEW



A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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## IF-POWER SCHEMATIC



## TUNER PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amplifier	6CY5	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6CL8	

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C201	5	1000		DI-000005	DD-050	L10V5	ZT-555	5GA-V5		
C202	15	1000		EF-001	MFT-1000			503C-DI		
C203	15	1000		BPD-001	DD-102	BYA8E	DC52I	5HK-DI		
C204	1000									
C205	.24			NPO-SI 1.5	TCZ-1R5	CTA8V15C	ZT-5515	5TCCB-V15		10%
C206	1.5			NPO-SI 1.5	TCZ-1R5	CTA8V15C	ZT-5515	5TCCB-V15		10%
C207	.91									
C208	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47		10%
C209	.39									
C210	1.0			NPO-SI 1	TCZ-1			5TCCB-V1		10%
C211	1.5									

### CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C212	100			EF-001	MFT-100					
C213	15			BPD-000015	DD-150			L10Q15	UC-5415	503C-TI
C214	120			BPD-00012	DD-121			L10T12	UC-5312	5GA-Q15
C215	1.5									56A-T12
C216	1000			EF-001	MFT-1000					503C-DI
C217	10			NPO-SI 10	TCZ-10			CTA8Q1C	ZT-541	57CC-QI
C218	1.5									
C219	1.5									
C220	1000			EF-001	MFT-1000					503C-DI
C221	1000			BPD-001	DD-102	BYA8DI		DC52I		5HK-DI

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		KNIGHT PART No.	NOTES	ITEM No.	RATING		KNIGHT PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R201	12K				R205	200K			
R202	10K				R206	3300Ω			
R203	22K				R207	15K			
R204	4700Ω				R208	5600Ω			

## IF-POWER PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st. IF Amplifier	6CB8	
V2	2nd. IF Amplifier	6CB8	

ITEM No.	USE	TYPE	NOTES
V3	Radio Detector	6AL5	
V4	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.40	300		AFH 2-33	D0016	FP217.87	TMD-31	D-130	TVL-2575
B	140	300							
C2	8	25		PRSL50V8	BBR8-150	TC4I	TD-8-150	MT-1508	TVA-1405

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.		
C3	10000			BPD-01	DD-103	BYA10E	DC51I	5HK-SI		
C4	1500			BPD-0015	DD-152	BYA10D15	DC52I5	5HK-D15		
C5	1500			BPD-0015	DD-152	BYA10D15	DC52I5	5HK-D15		
C6	10000			BPD-01	DD-103	BYA10E	DC51I	5HK-SI		
C7	2			NPO-SI 2	C10V2C					NPO s. 25mmfd
C8	10000			BPD-01	DD-103	BYA10E	DC51I	5HK-SI		
C9	10000			BPD-01	DD-103	BYA10E	DC51I	5HK-SI		
C10	10000			BPD-01	DD-103	BYA10E	DC51I	5HK-SI		
C11	330				MD-331	L10T33				10%
C12	330				MD-331	L10T33				10%
C13	330				MD-331	L10T33				10%
C14	5000			BPD-005	DD-502	BYA10D6	DC525	5HK-D6		
C15	.1	200		P288N-1	DF-104	CUB2P1	GEM-20L	2TM-P1		

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	KNIGHT PART No.	Haldorson PART No.	Merit PART No.	Ram PART No.	Stoncor PART No.	Thordarson PART No.	Triod PART No.
T1	117V @.30A	355VCT @.043A	6.3V @2.1A	LP-0245						

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA						
		KNIGHT PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES	
L1	Fil. Choke		19-1000	BC-561	4594	VP-9	.9 Microhenry	
L2	IF Trans.	LR-0044						
L3	Radio Det.	LQ-0160						
L4	Fil. Choke		19-1000	BC-561	4594	VP-9	.9 Microhenry	

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		KNIGHT PART No.	NOTES	ITEM No.	RATING		KNIGHT PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	1200Ω				R10	15K			
R2	4700Ω				R11	1000Ω			
R3	1000Ω				R12	15K			
R4	27K				R13	1200Ω			
R5	100Ω				R14	15K			
R6	10K				R15	2200Ω	2		Note 1
R7	27K				R18	2200Ω	2		Note 1
R8	100Ω				R17	47Ω			
R9	47Ω				R18	47Ω			

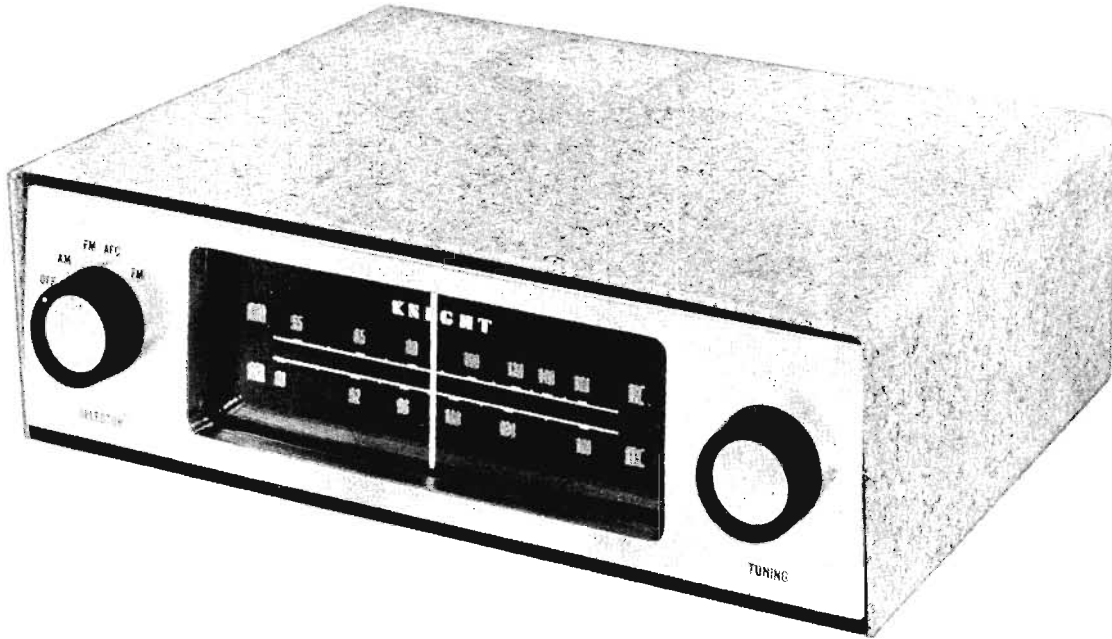
Note 1. When R15 is 110Ω, R18 is not used.

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Lamp		#1847
M2	Tuner	JU-0017	V8F
M3	Switch		Power

### WIRING DATA

General-use Unshielded Hook-up Wire .....	Use BELDEN No. 8530 (Solid) Available in Ten Colors
Power Cord .....	Use BELDEN No. 8524 (Stranded) Available in Ten Colors
	1785-B (6 Ft. Length)
	1785-K (7½ Ft. Length)



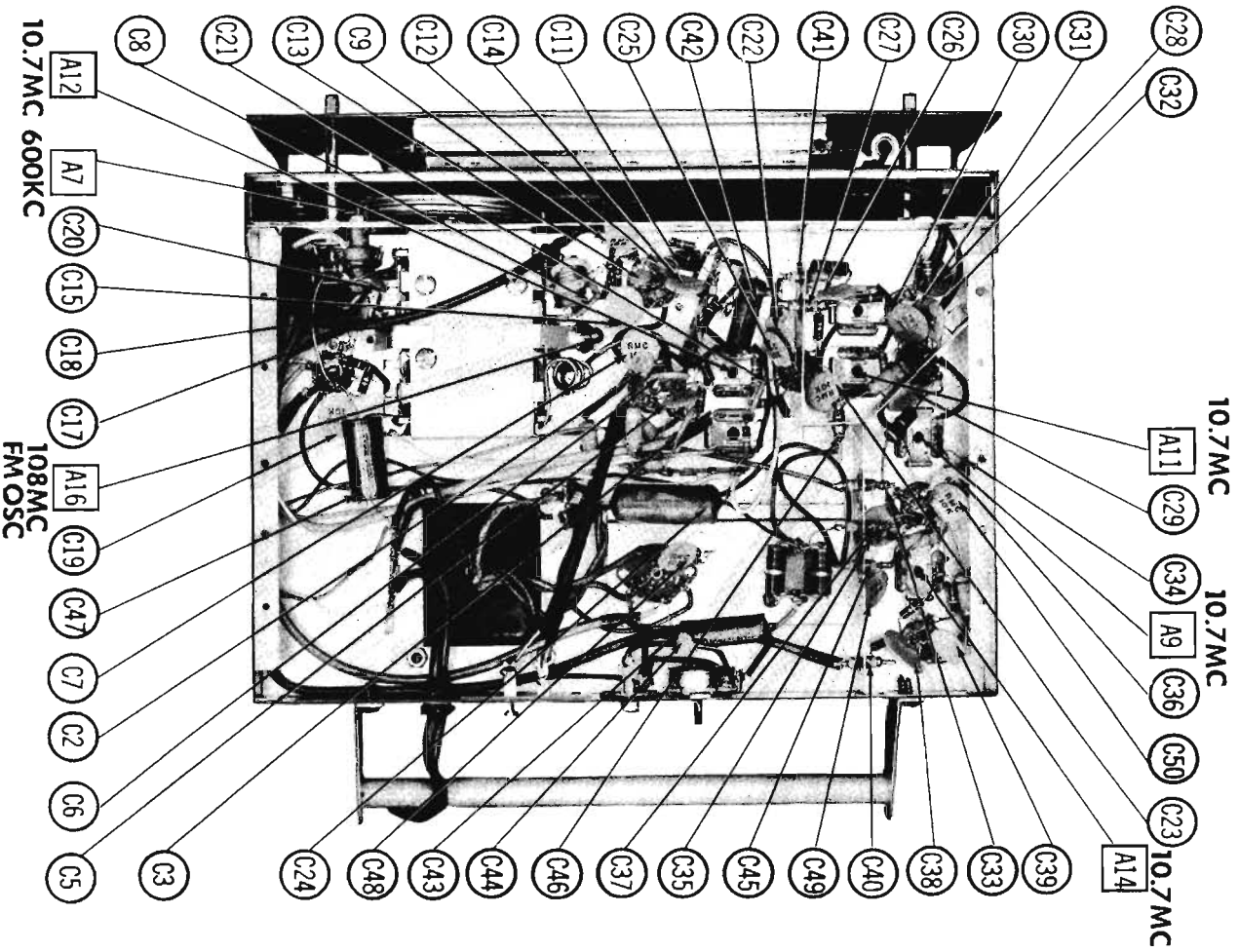
**KNIGHT  
 MODEL 94SX703**

TRADE NAME	Knight Model 94SX703		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.		
TYPE SET	AC Operated FM-AM Tuner		
TUBES (Eight)	Types 12AT7 FM RF Amp. - Mixer, 12AT7 FM Osc. - AFC, 6BE6 AM Converter, 6CB6 1st IF Amplifier, 6CB6 2nd FM IF Amp. - AM Det, 6AU6 Limiter, 6AL5 Discriminator, 6X4 Rectifier		
POWER SUPPLY	110-120 Volts AC - 50/60 Cycles	RATING	.38 Amp. @ 117 Volts AC
TUNING RANGE - BROADCAST	550KC - 1630KC	FM	88MC - 108MC

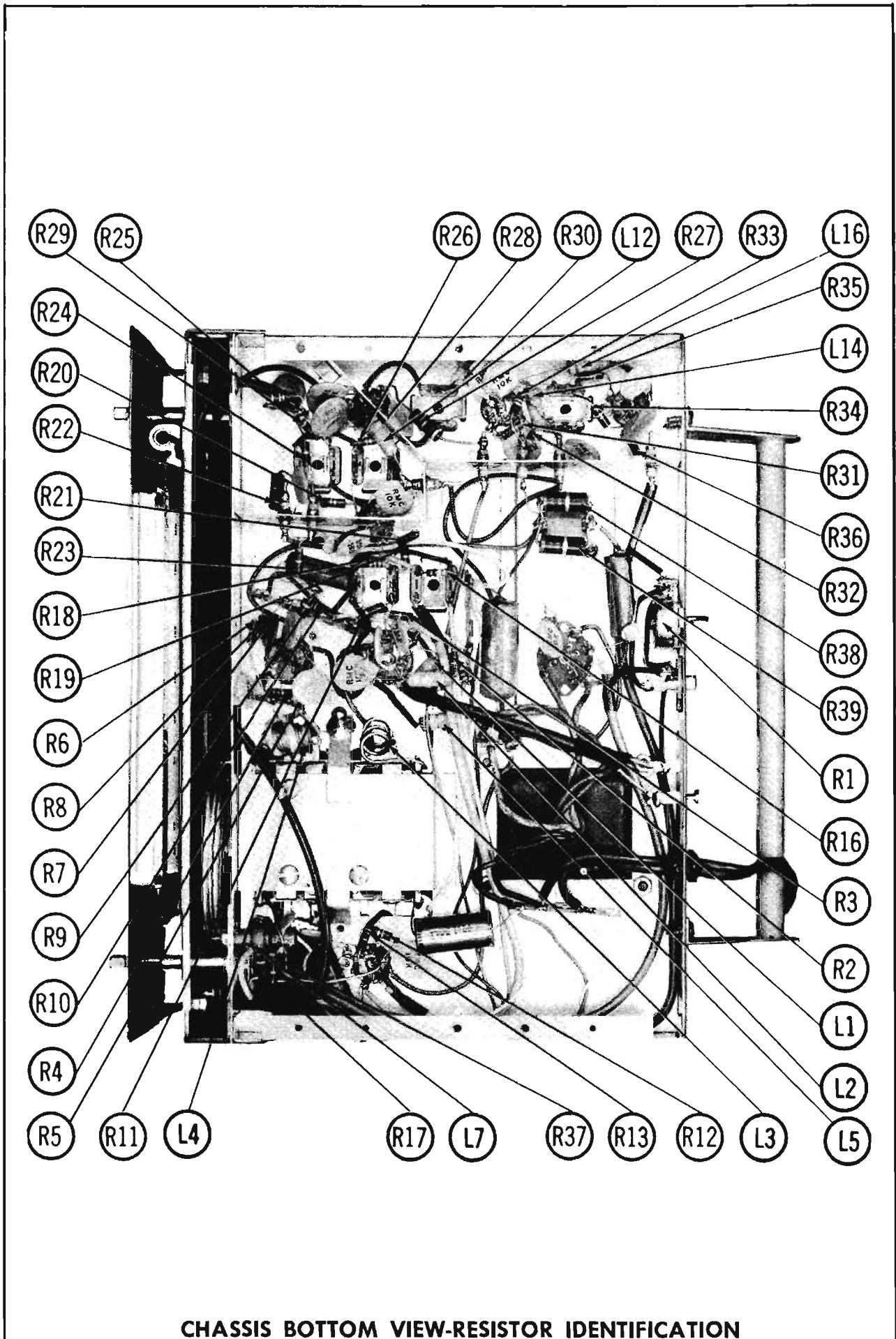
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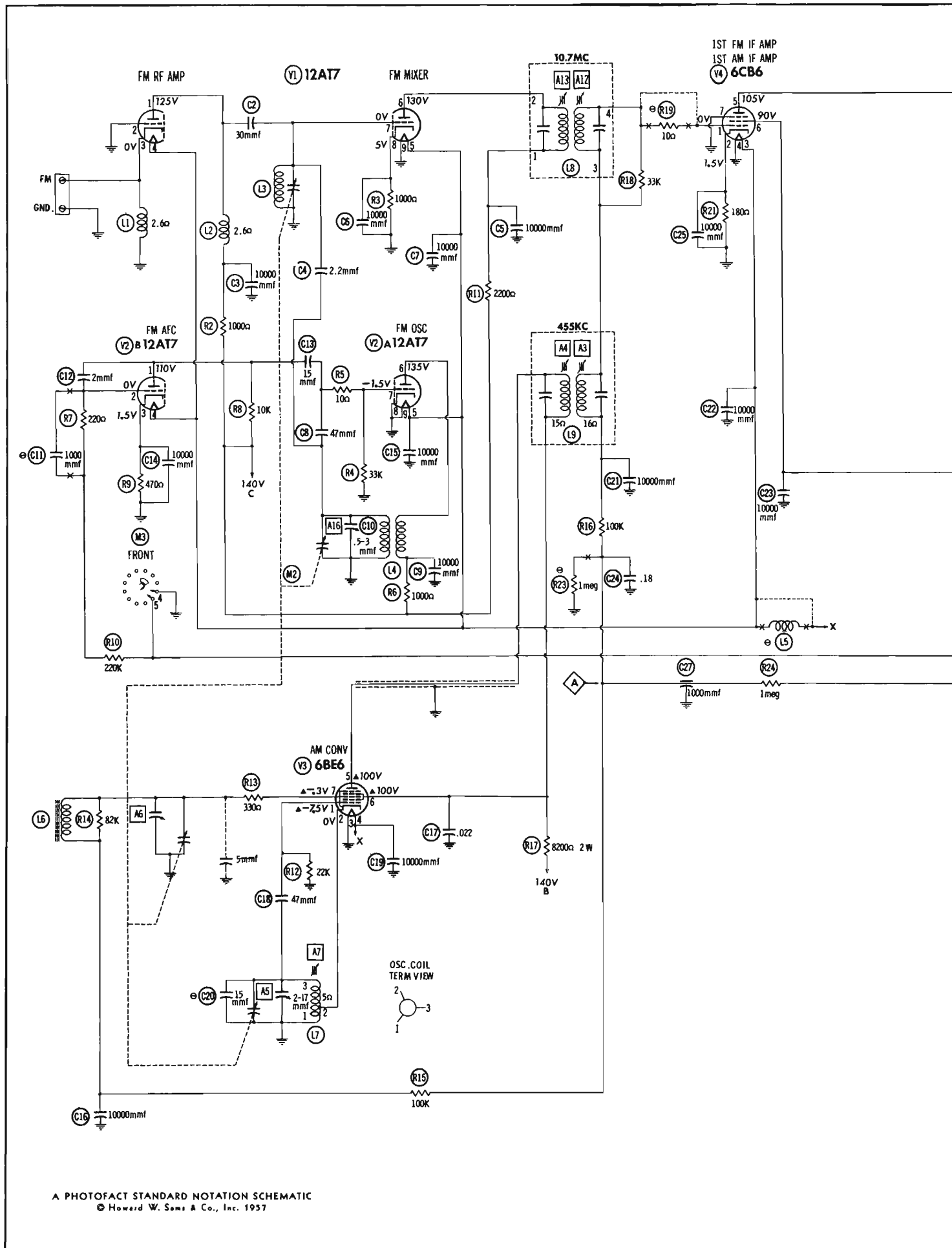
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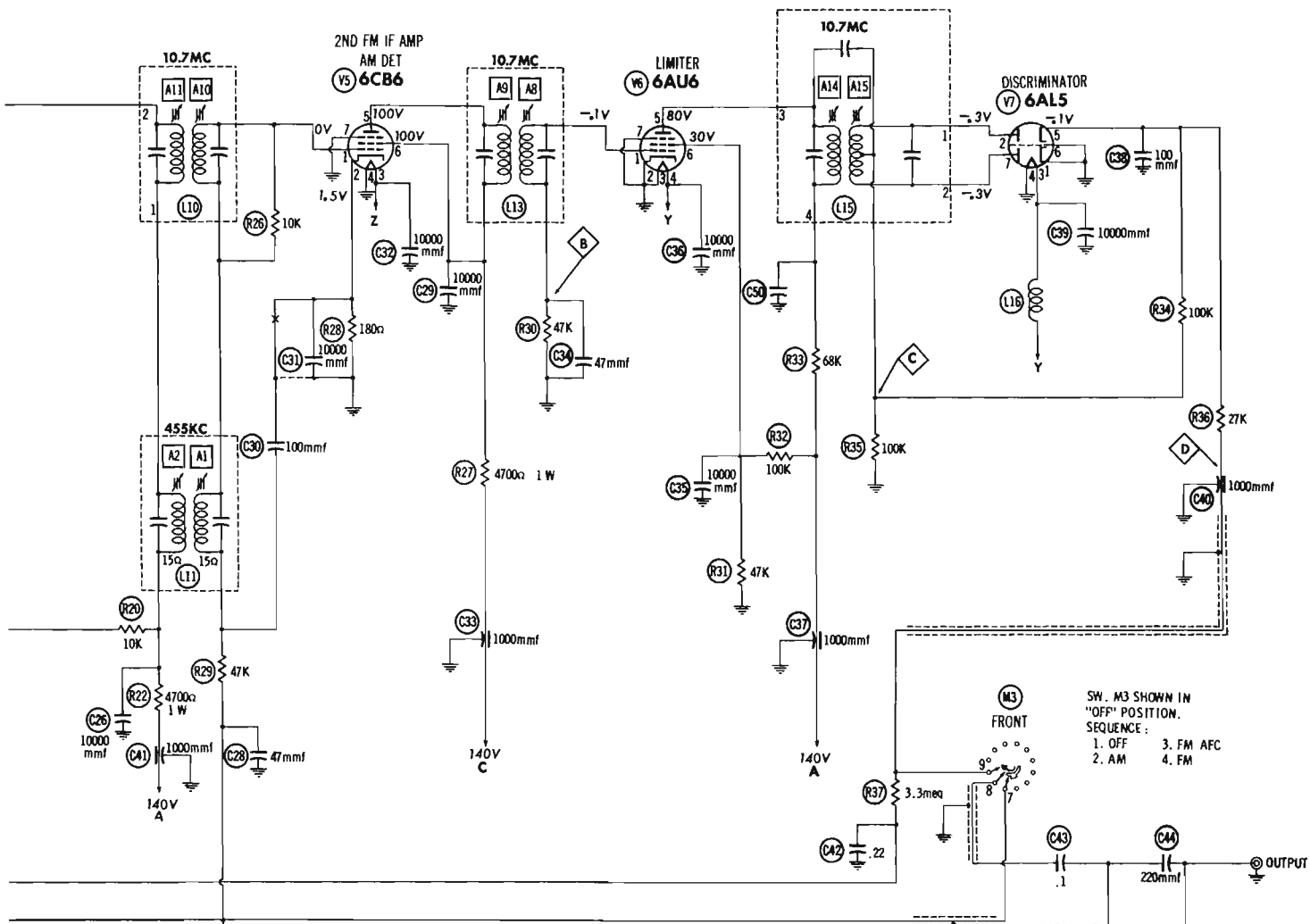


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**





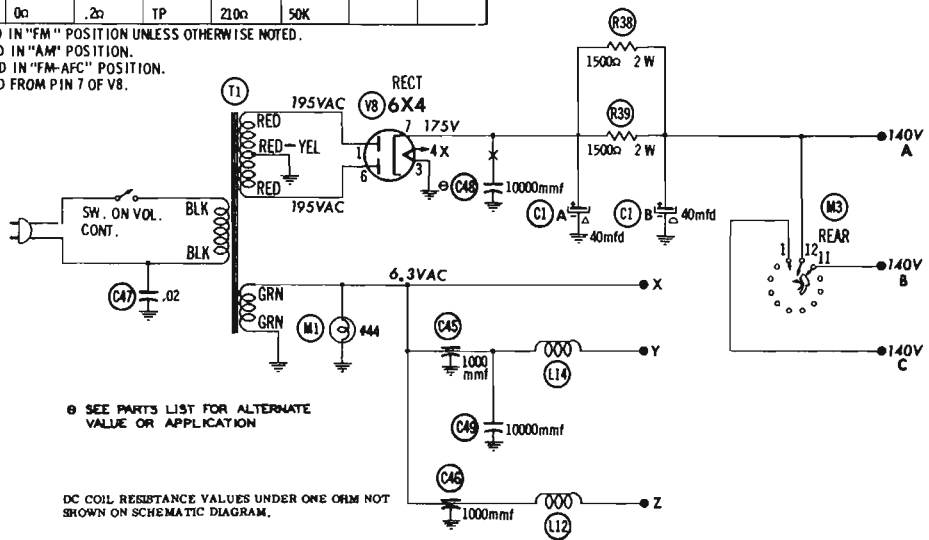
SW. M3 SHOWN IN "OFF" POSITION.  
SEQUENCE:  
1. OFF 3. FM AFC  
2. AM 4. FM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AT7	†1700Ω	0Ω	2.6Ω	.4Ω	.4Ω	†3000Ω	0Ω	1000Ω	0Ω
V2	12AT7	†10K	220K	470Ω	.4Ω	.4Ω	†1700Ω	33K	0Ω	0Ω
V3	6BE6	22K	.4Ω	0Ω	.2Ω	†9000Ω	†9000Ω	700K		
V4	6CB6	700K	180Ω	.4Ω	0Ω	†5400Ω	†15K	0Ω		
V5	6CB6	500K	180Ω	.4Ω	0Ω	†5400Ω	†5400Ω	0Ω		
V6	6AU6	47K	0Ω	0Ω	.4Ω	†68K	†50K	0Ω		
V7	6AL5	0Ω	100K	.6Ω	0Ω	200K	0Ω	100K		
V8	6X4	200Ω	NC	0Ω	.2Ω	TP	210Ω	50K		

MEASURED IN "FM" POSITION UNLESS OTHERWISE NOTED.  
 † MEASURED IN "AM" POSITION.  
 ‡ MEASURED IN "FM-AFC" POSITION.  
 † MEASURED FROM PIN 7 OF V8.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 1% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.



SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE ORM NOT SHOWN ON SCHEMATIC DIAGRAM.

# ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT								
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. To set pointer, turn tuning capacitor fully closed and set pointer parallel with base of dial.								
AM ALIGNMENT								
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS	
1.	.01MFD	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (400v Mod)	AM	Point of non-interference.	DC probe to point $\textcircled{A}$ . Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2.	270 $\Omega$ carbon resistor	High side thru 270 $\Omega$ to AM antenna stator lug on tuning gang. Low side to chassis.	1500KC	"	1500KC	"	A5, A6	"
3.	"	"	600KC	"	600KC	"	A7	"
FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM								
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS	
4.	.01MFD	High side to pin 7 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (unmod)	FM	Point of non-interference.	DC probe to point $\textcircled{B}$ . Common to chassis.	A8, A9, A10, A11, A12, A13	Adjust for maximum deflection.
5.	"	"	"	"	"	DC probe to point $\textcircled{C}$ . Common to chassis.	A14	"
6.	"	"	"	"	"	DC probe to point $\textcircled{D}$ . Common to chassis.	A15	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE								
Use frequency modulated signal with 60v modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.								
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS	
4.	.01MFD	High side to pin 7 (grid) of 12AT7 (V1). Low side to chassis.	10.7MC (450 KC Swp)	FM	Point of non-interference.	Vert. amp. to point $\textcircled{B}$ . Low side to chassis.	A8, A9, A10, A11, A12, A13	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1
5.	"	"	"	"	"	Vert. amp. to point $\textcircled{C}$ . Low side to chassis.	A14	"
6.	"	"	"	"	"	Vert. amp. to point $\textcircled{D}$ . Low side to chassis.	A15	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A14 for maximum amplitude and straightness of crossover lines.
FM RF ALIGNMENT								
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS	
7.	270 $\Omega$ carbon resistor	High side thru 270 $\Omega$ to FM antenna terminal. Low side to chassis.	108MC	FM	108MC	DC probe to point $\textcircled{E}$ . Common to chassis.	A16	Adjust for maximum deflection.
8.	"	"	88MC	"	88MC	"	L3, L4	Adjust for maximum deflection by compressing or expanding coil turns.

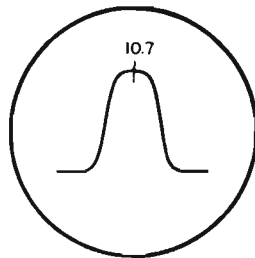


FIG. 1

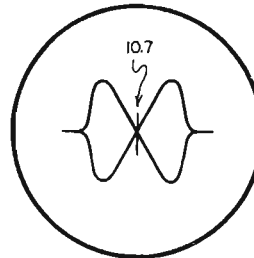
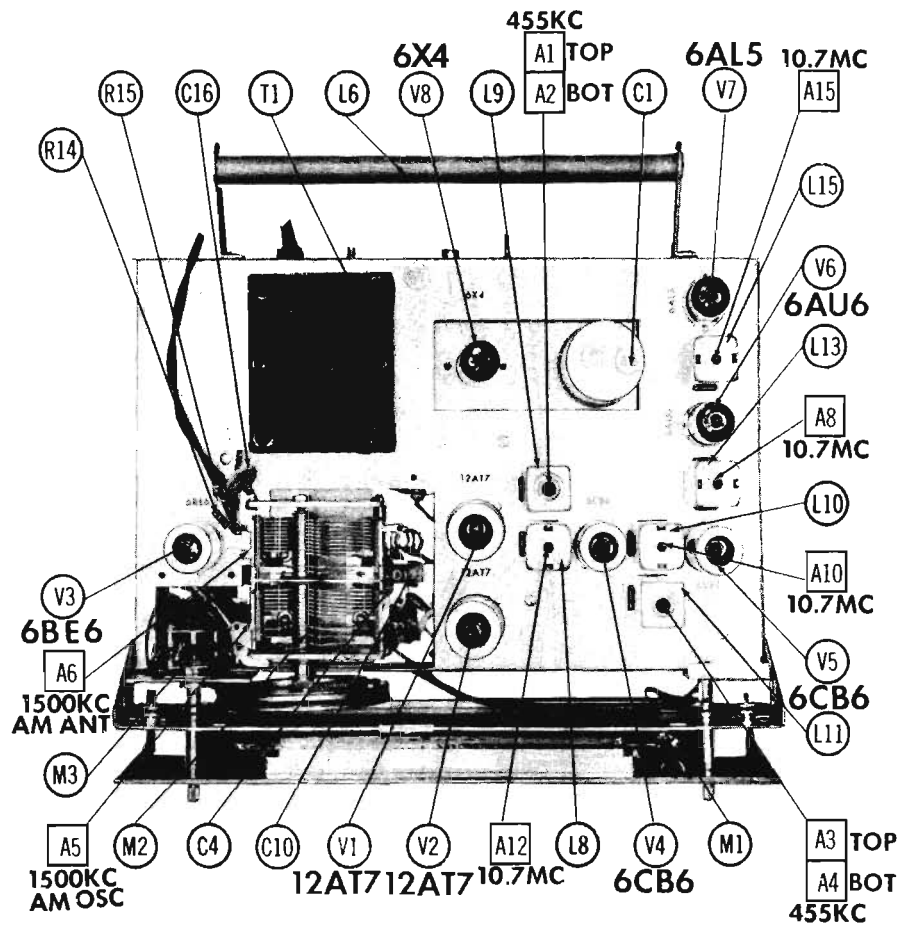
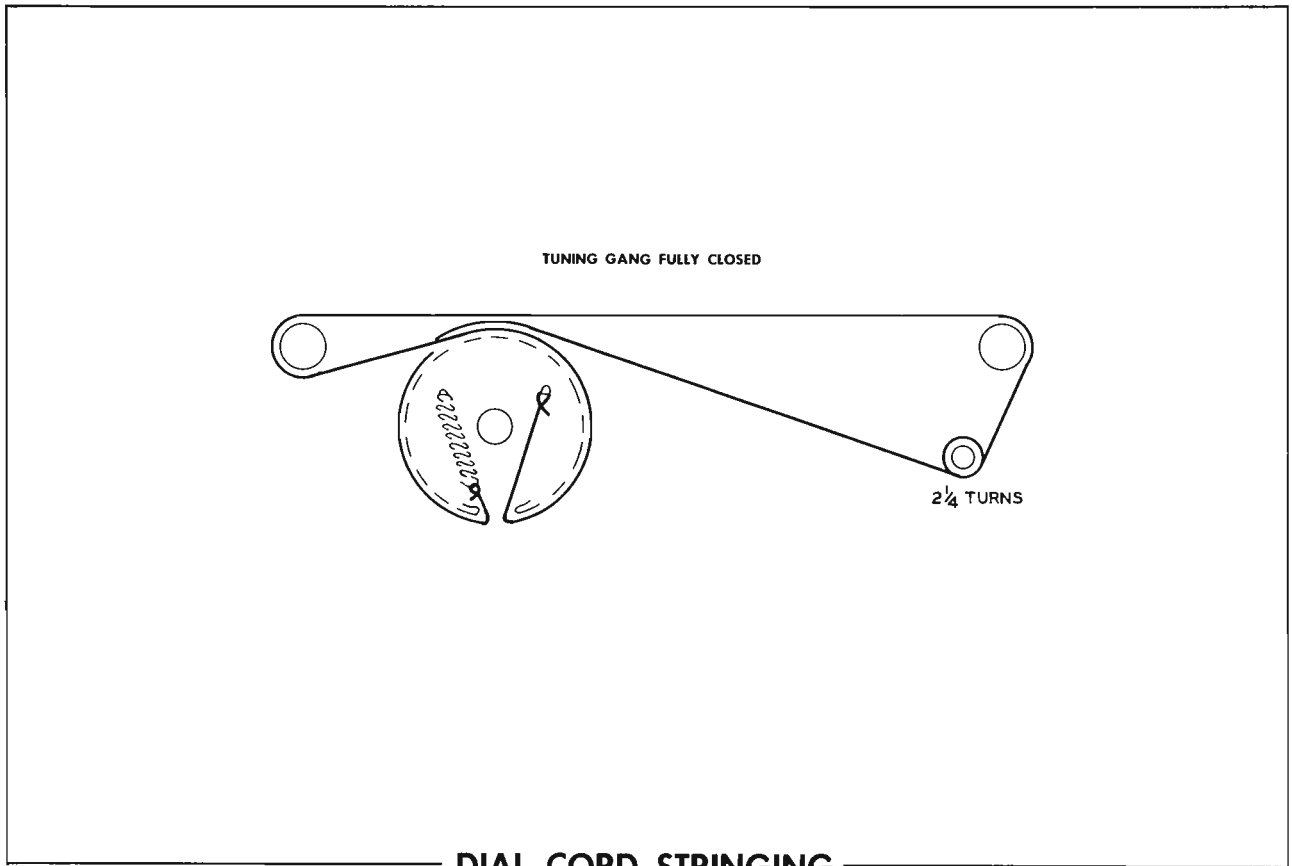


FIG. 2



CABINET-TOP VIEW





## PARTS LIST AND DESCRIPTIONS TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amp - Mixer	12AT7		V5	2nd FM IF Amp - AM Del.	6CB6	
V2	FM Oscillator-AFC	12AT7		V6	Limiter	6AU6	
V3	AM Converter	6BE6		V7	Discriminator	6AL5	
V4	1st IF Amplifier	6CB6		V8	Rectifier	5X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNBELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	440	300		AFH4-01-80	DO016	EP217. 87	TMQ-2		TVL-3577
C1B	440	300							

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mico and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNBELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C2	30										
C3	10000										
C4	2.2										
C5	10000										
C6	10000										
C7	10000										
C8	10										
C9	100000										
C10	4.7										
C11	1000										
C12	2										
C13	15										
C14	10000										
C15	10000										
C16	10000										
C17	.022	200									
C18	47										
C19	10000										
C20	15										
C21	10000										
C22	10000										
C23	10000										
C24	.18										
C25	10000	200									
C26	10000										
C27	10000										
C28	10000										
C29	10000										
C30	100										
C31	10000										
C32	10000										
C33	10000										
C34	47										
C35	10000										
C36	10000										
C37	1000										
C38	100										
C39	10000										
C40	10000										
C41	10000										
C42	22	200									
C43	.1	200									
C44	220										
C45	1000										
C46	1000										
C47	.02										
C48	10000	600									
C49	10000										
C50	10000										

Note 1: Not used in some versions.  
Note 2: Some versions may use 22MMF in this application.

## PARTS LIST AND DESCRIPTIONS (Continued) CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES	
	RESISTANCE	WATTS	KNIGHT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	500K	1					B13-133	TASSA	Volume
R1B	Shaft						TM2-KIT	Not Req.	

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	OHMS	WATT	KNIGHT PART No.	IRC PART No.	MALLORY PART No.	SPRAGUE PART No.	
R2	10000						
R3	10000						
R4	33K						
R5	10K						
R6	10000						
R7	220K						
R8	10K						
R9	470K						
R10	220K						
R11	2200K						
R12	22K						
R13	330K						
R14	82K						
R15	100K						
R16	100K						
R17	6200K						
R18	33K	2					
R19	10K						
R20	10K						

Note 1: Not used in some versions.

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PR.	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Halderson PART No.	Merit PART No.	Sancor PART No.	Thordanson PART No.	Tried PART No.
T1	117VAC @ .38A	355VCT @ .043A	6.3VAC @ 2.9A		LP-0245					

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA			NOTES
		KNIGHT PART No.	MEISSNER PART No.	MILLER PART No.	
L1	RF Choke				
L2	RF Choke				
L3	FM RF Coil	LL-0054			
L4	FM Osc. Coil	LL-0055			
L5	Fl. Choke				
L6	AM Loop Stick	LW-0098			
L7	AM Osc. Coil	LL-0049			
L8	1st FM IF	LR-0033	16-3487	FM-254	1483
L9	1st AM IF	LR-0041	18-8770	BC-355	12-C6
L10	2nd FM IF	LR-0033	16-3487	FM-254	1463
L11	2nd AM IF	LR-0041	16-8770	BC-355	12-C6
L12	Fl. Choke				
L13	Limiter	LR-0033	16-3487	FM-254	1463
L14	Fl. Choke				
L15	Discriminator	LQ-0179	17-3494	FM-253	1464
L16	Fl. Choke				

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES	
			444	445
M1	Dial Lamp			
M2	Tuning Cap.	CV601	4 Gang - AM Sections: 25-407MMF, 23-195MMF	
M3	Switch		Function Selector, Wafer Type	

Note 1:



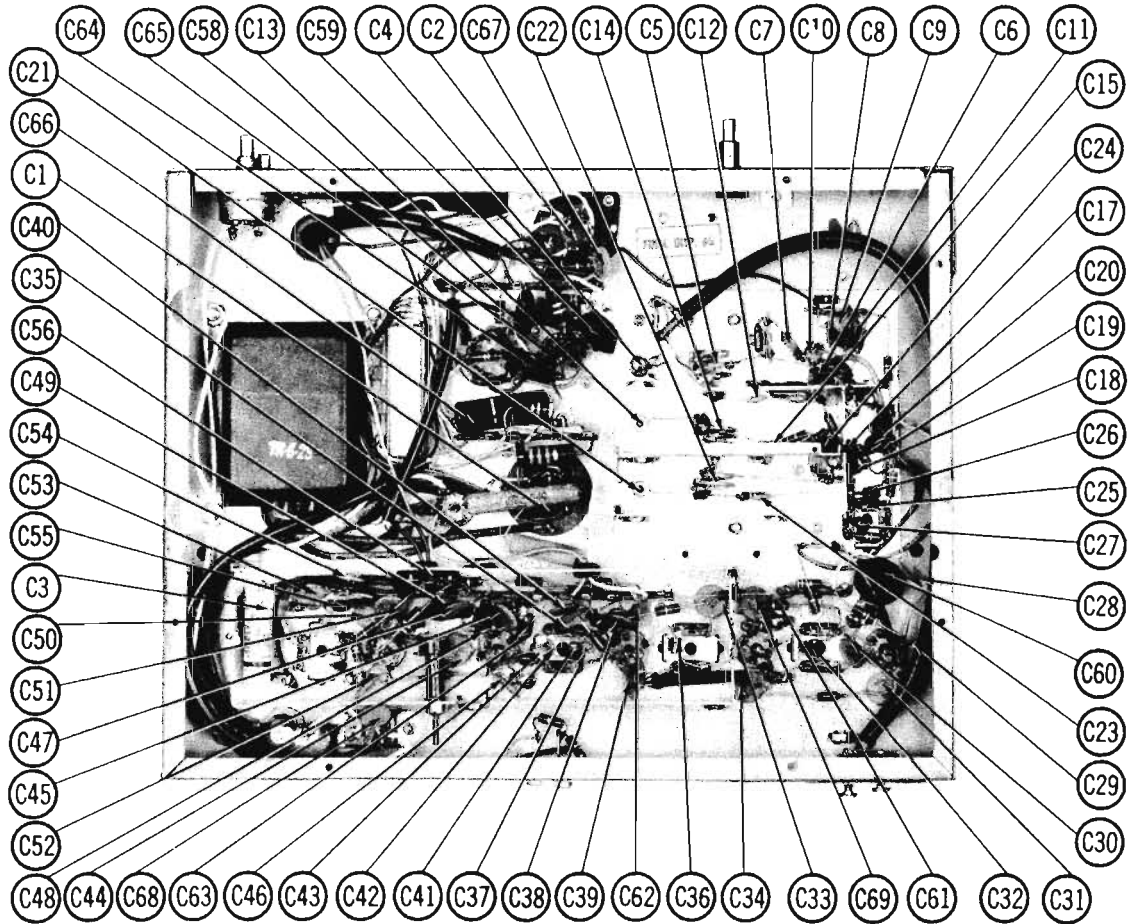
**H. H. SCOTT  
 MODEL 310B**

<b>TRADE NAME</b>	H. H. Scott Model 310B		
<b>MANUFACTURER</b>	Hermon Hosmer Scott, Inc., 325 Putnam Ave., Cambridge 38, Mass.		
<b>TYPE SET</b>	AC Operated FM Tuner		
<b>TUBES</b>	Ten		
<b>POWER SUPPLY</b>	105-125Volts AC-50/60 Cycles	<b>RATING</b>	.36 Amp. @ 117 Volts AC (36 Watts)
<b>TUNING RANGE—FREQ. MOD.</b>	87MC - 109MC		

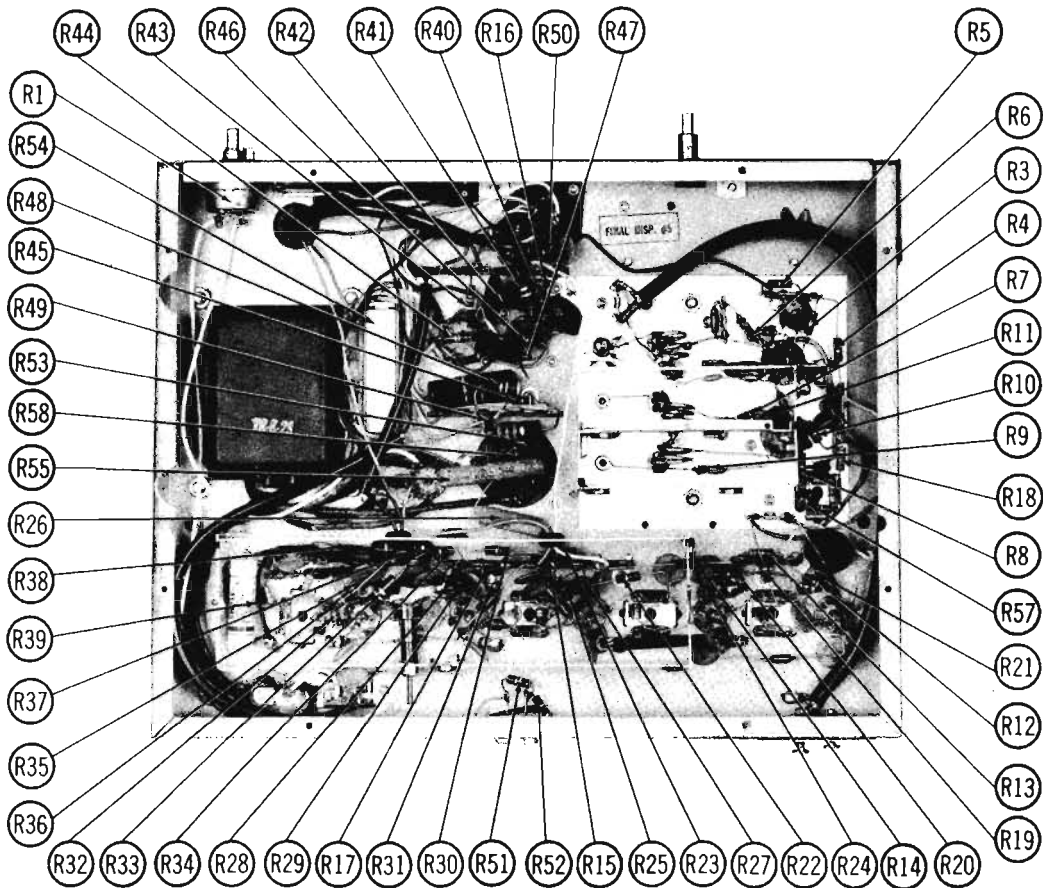
**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H106

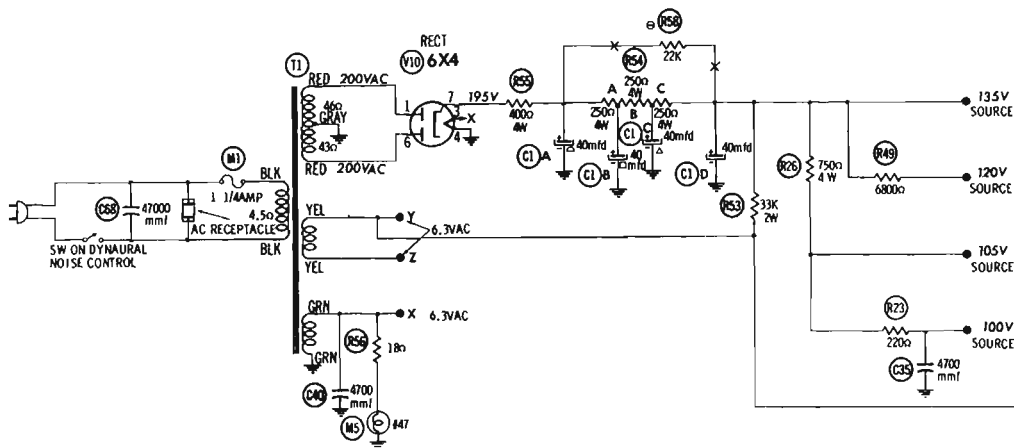
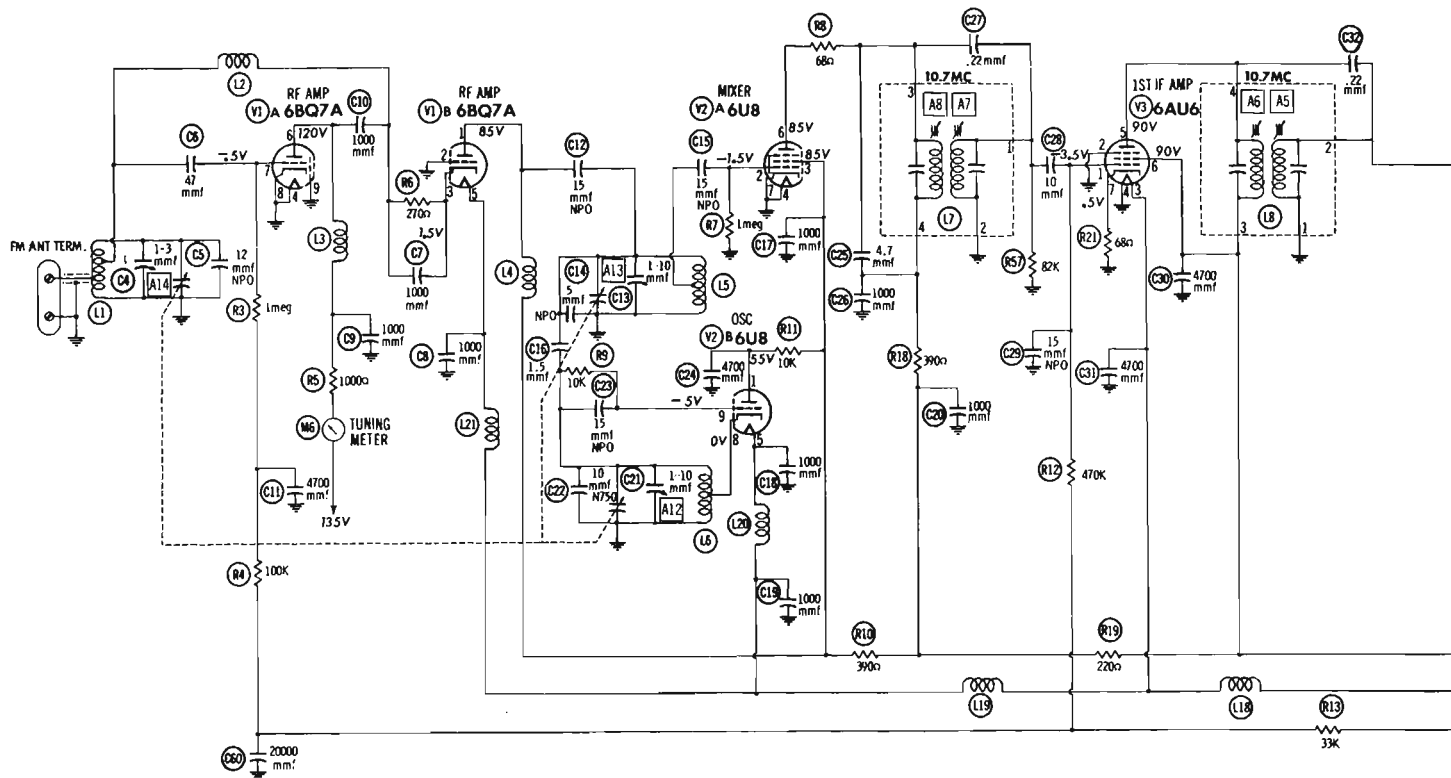
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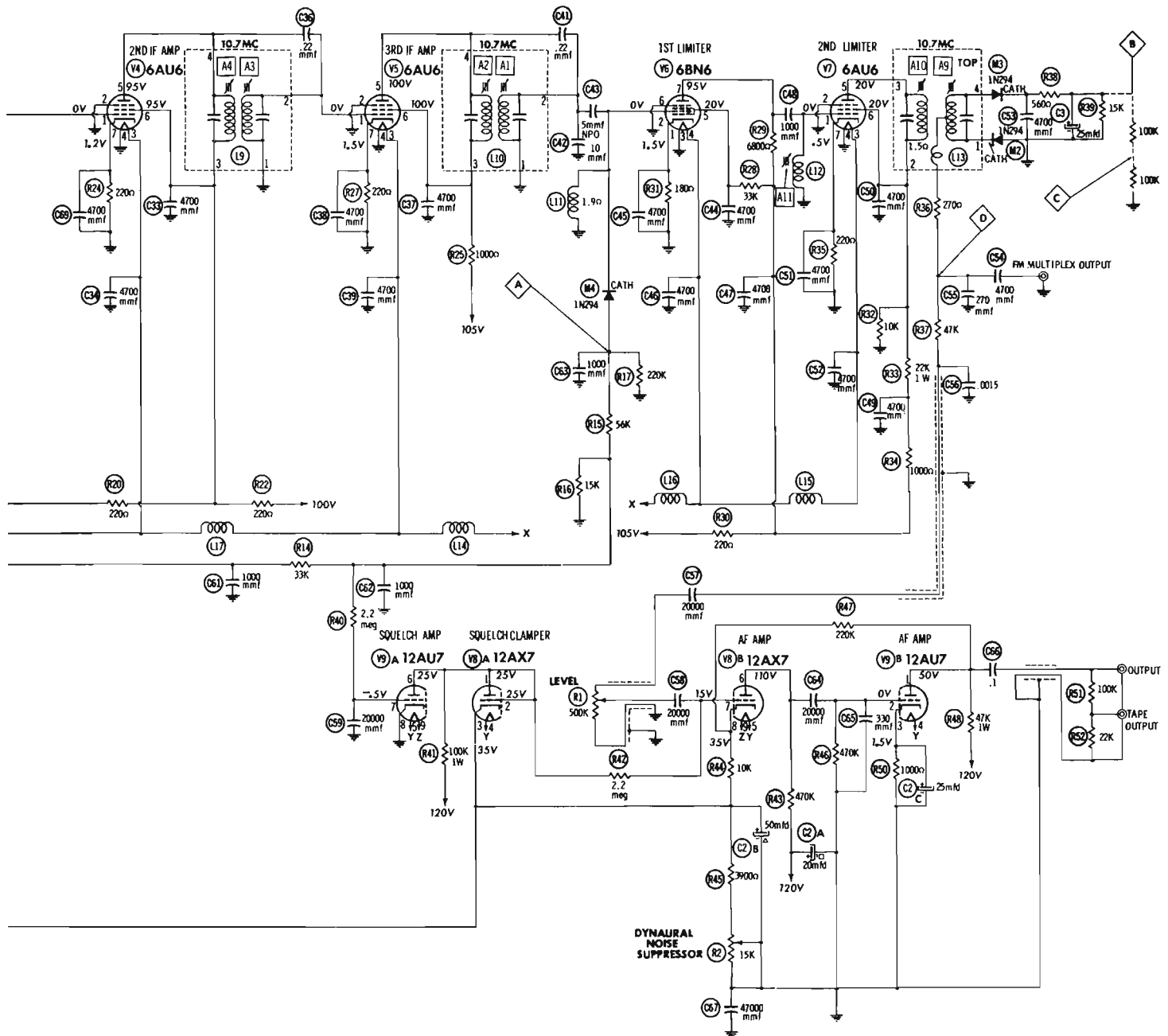
**CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION**



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**



A PHOTOFAC STANDARD NOTATION SCHEMATIC  
Howard W. Sams & Co., Inc. 1957



RESISTANCE READINGS

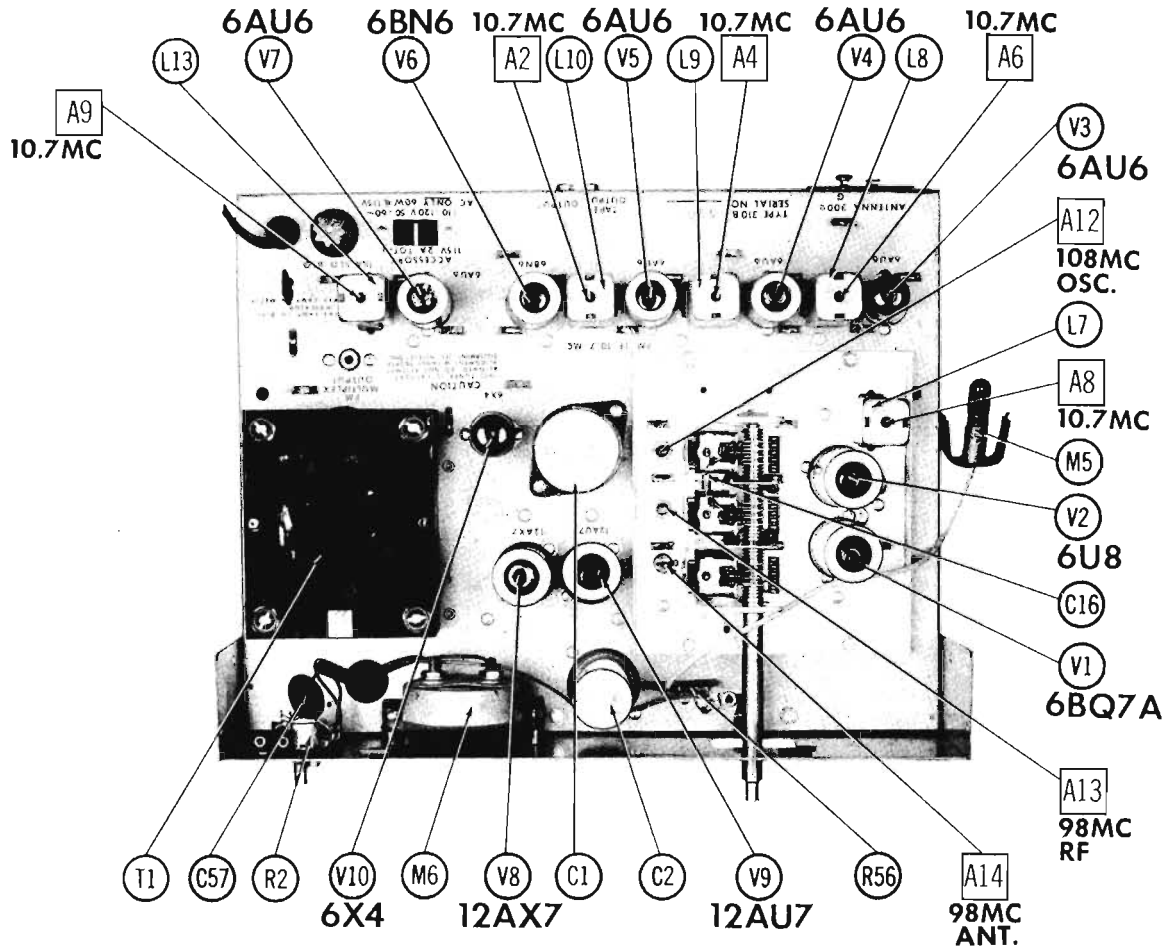
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BQ7A	† 3250Ω	0Ω	270Ω	0Ω	.4Ω	† 2250Ω	1.2Meg	0Ω	0Ω
V2	6U8	† 1.3K	1Meg	† 3250Ω	0Ω	.4Ω	† 3300Ω	0Ω	0Ω	10K
V3	6AU6	550K	0Ω	.3Ω	0Ω	† 2650Ω	† 2650Ω	68Ω		
V4	6AU6	.6Ω	0Ω	.2Ω	0Ω	† 2400Ω	† 2400Ω	220Ω		
V5	6AU6	.6Ω	0Ω	.1Ω	0Ω	† 3000Ω	† 3000Ω	220Ω		
V6	6BN6	180Ω	1.9Ω	0Ω	.1Ω	† 35K	0Ω	† 9000Ω		
V7	6AU6	.7Ω	0Ω	.2Ω	0Ω	† 25K	† 25K	220Ω		
V8	12AX7	† 100K	† 100K	+ 13K	† 11K	† 11K	† 470K	† 2.3Meg	■ 23K	† 11K
V9	12AU7	† 50K	470K	1000Ω	† 11K	† 11K	† 100K	2.2Meg	0Ω	† 11K
V10	6X4	46Ω	NC	.1Ω	0Ω	TP	43Ω	20K(Min)		

† MEASURED FROM PIN 7 OF V10  
 ■ THIS READING WILL VARY, CONTROL SET FOR NORMAL OPERATION  
 TP TIE POINT  
 NC NO CONNECTION

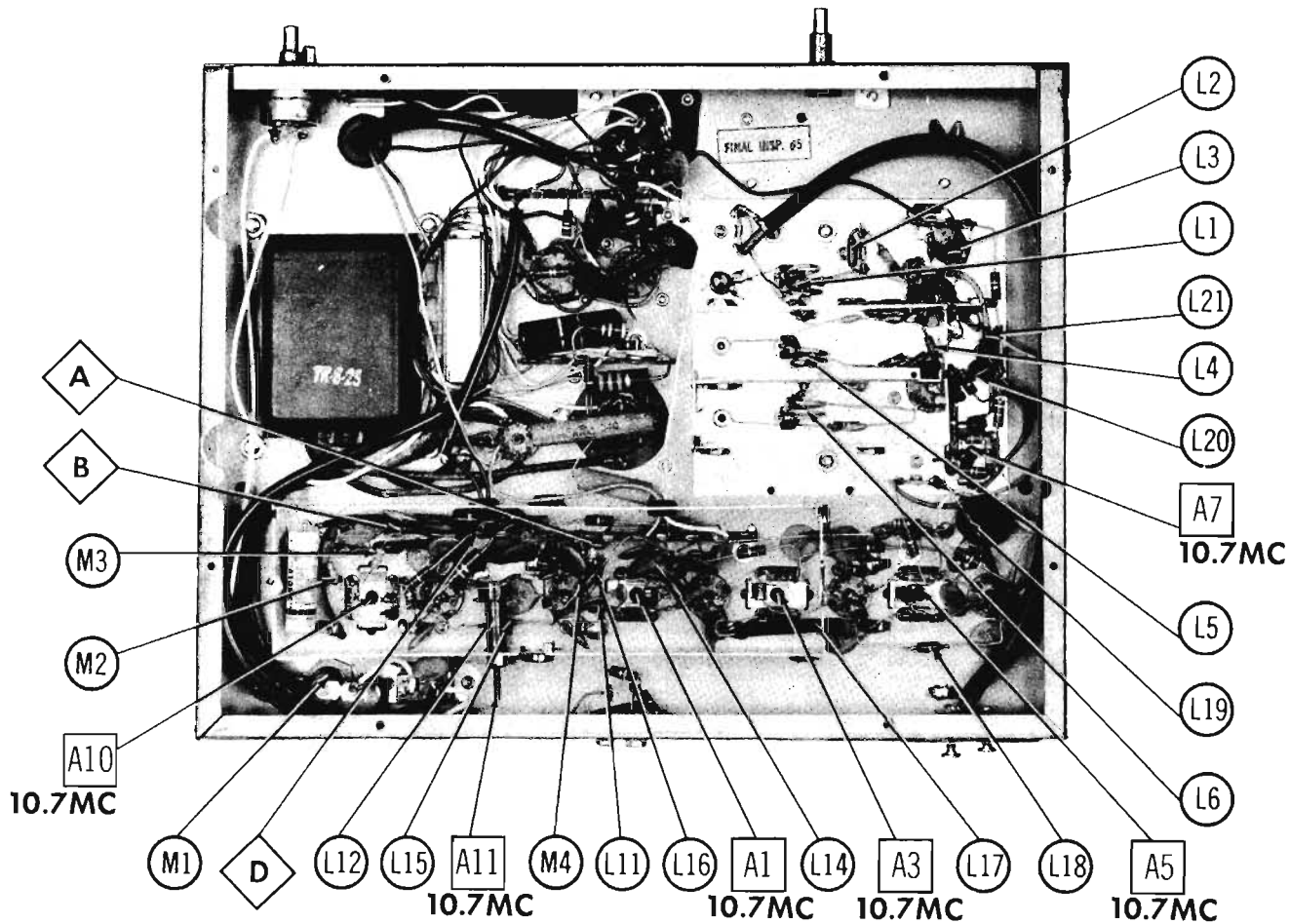
- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM.



CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW - INDUCTOR & ALIGNMENT IDENTIFICATION



## PARTS LIST AND DESCRIPTIONS TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	RP Amplifier	6BQ7A		V6	1st Limiter	6BN6	
V2	Mixer-Oscillator	6U8		V7	2nd Limiter	6AU6	
V3	1st IF Amplifier	6AL5		V8	Squeech Clamper-AF Amp.	12AX7	
V4	2nd IF Amplifier	8AU6		V9	A F Amp. Squeech Amp.	12AU7	
V5	3rd IF Amplifier	6AU6		V10	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	H. R. SCOTT PART No.	AEROVOX PART No.	CORNELL DUBILIER PART No.	MALLORY PART No.	PYRAMO PART No.	SANGAMO PART No.	
C1A	40	300			D0034				R2446 *
B	40	300							
C	40	300							
D	40	300							
C2A	20	200		AFH3-80-50			T-090		R2445 *
B	50	100							
C	25	25		PRS25V25	BBR25-25		TC26	TD-25-25	TVA-1205
C3	25	25							

\* Non-Catalog Item.

### FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	H. R. SCOTT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	
C4	1-3				828-4		3U5-E	CTS51	
C5	12			NP0-81.12	TCZ-12	C10Q2C	TCO-12	UC-5447	5GA-Q47
C6	47			BPD-00047	DD-001	L10Q47	ED-47	DC51	5BK-Q47
C7	1000				DD-001	BYA8D	ED-1000	DC52	5BK-D1
C8	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C9	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C10	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C11	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C12	15				NP0-81.15	TCZ-15	C10Q15C	TCO-15	5TKC-Q15
C13	1-10								
C14	5				NP0-81.5	TCZ-5	C10V5C	TCO-5	ZT-555
C15	15				NP0-81.15	TCZ-15	C10Q15C	TCO-15	5TKC-Q15
C16	1000				NP0-81.1.5	TCZ-1R5	C10V15C	TCO-1.5	ZT-5515
C17	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C18	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C19	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C20	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C21	1-10								
C22	10				N750-81.10	TCN-10	C10QU	TC7-10	NT-541
C23	15				NP0-81.15	TCZ-15	C10Q15C	TCO-15	5TKC-Q15
C24	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C25	4.7				NP0-81.4.7	TCZ-4R7	C10V47C	TCO-4.7	ZT-5547
C26	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52
C27	22								
C28	10				BPD-00001	DD-100	L10Q	ED-10	UC-541
C29	15				BPD-001	DD-102	C10Q15C	TCO-15	5TKC-Q15
C30	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C31	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C32	22								
C33	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C34	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C35	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C36	22								
C37	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C38	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C39	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C40	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C41	22								
C42	10				BPD-00001	DD-100	L10Q	ED-10	UC-541
C43	5								
C44	4700				NP0-81.5	TCZ-5	C10V5C	TCO-5	ZT-555
C45	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C46	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C47	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247
C48	1000				BPD-001	DD-102	BYA8D	ED-1000	DC52

## PARTS LIST AND DESCRIPTIONS (Continued) CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	H. R. SCOTT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.		SPRAGUE PART No.
C49	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C50	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C51	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C52	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C53	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C54	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C55	4700				1488-00027	D8-270	5W8237	ED-270	UC-5327	5FH-327
C56	0015	400			BPD-0015	D8-152	CUB8D15	GP-1500	GEM-8215	BKM-D15
C57	20000				BPD-02	DD-203	BYB82	ED-02	5HK-02	5HK-02
C58	20000				BPD-02	DD-203	BYB82	ED-02	5HK-02	5HK-02
C59	20000				BPD-02	DD-203	BYB82	ED-02	5HK-02	5HK-02
C60	20000				BPD-02	DD-203	BYB82	ED-02	5HK-02	5HK-02
C61	1000				BPD-001	DD-102	BYA6D1	ED-1000	DC521	5BK-D1
C62	1000				BPD-001	DD-102	BYA6D1	ED-1000	DC521	5BK-D1
C63	1000				BPD-001	DD-102	BYA6D1	ED-1000	DC521	5BK-D1
C64	20000				BPD-02	DD-203	BYB82	ED-02	5HK-02	5HK-02
C65	330				1488-00033	D8-331	5W8233	ED-330	UC-5333	IFM-333
C66	1	400			P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1
C67	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C68	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47
C69	4700				BPD-0047	DD-472	BYA10D47	ED-0047	UC-5247	5BK-D47

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	H. R. SCOTT PART No.	CENTRALAB PART No.	CLAIROSTAT PART No.	IRC PART No.	MALLORY PART No.	
RIA	500K	1/2	RCV-500K-3	B-90	A47-500K-Z	Q13-133	U48	Level
RAA	15K	1/2	RCV-15K-35W	B-20	A47-15K-B	Q11-119	U26	Dynaural Noise Supp.
B	50K	1/2		Not Req.	RS-2	Not Req.	US-28	
C	50K	1/2		Not Req.	RS-2	Not Req.	US-28	
	Switch			KB-1	SWE-12	Not Req.		

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		REPLACEMENT DATA			REPLACEMENT DATA			NOTES
	OHMS	WATT	H. R. SCOTT PART No.	IRC PART No.	H. R. SCOTT PART No.	IRC PART No.			
R2	1Meg			BTS-1Meg		R32	10K	BTS-10K	
R4	100K			BTS-100K		R33	22K	BTS-22K	
R5	1000Ω			BTS-1000		R34	1000Ω	BTS-1000	
R6	270Ω			BTS-270		R35	220Ω	BTS-220	
R7	1Meg			BTS-1Meg		R36	270Ω	BTS-270	
R8	68Ω			BTS-68		R37	47K	BTS-47K	
R9	10K			BTS-10K		R38	580Ω	BTS-580	
R10	390Ω			BTS-390		R39	15K	BTS-15K	
R11	10K			BTS-10K		R40	2.2Meg	BTS-2.2Meg	
R12	470K			BTS-470K		R41	100K	BTA-100K	
R13	33K			BTS-33K		R42	2.2Meg	BTS-2.2Meg	
R14	33K			BTS-33K		R43	470K	BTS-470K	
R15	56K			BTS-56K		R44	10K	BTS-10K	
R16	15K			BTS-15K		R45	3900Ω	BTS-3900	
R17	220K			BTS-220K		R46	470K	BTS-470K	
R18	300Ω			BTS-300		R47	220K	BTS-220K	
R19	220Ω			BTS-220		R48	47K	BTA-47K	
R20	220Ω			BTS-220		R49	6800Ω	BTS-6800	
R21	68Ω			BTS-68		R50	1000Ω	BTS-1000	
R22	220Ω			BTS-220		R51	100K	BTS-100K	
R23	220Ω			BTS-220		R52	22K	BTS-22K	
R24	220Ω			BTS-220		R53	33K	BTS-33K	
R25	1000Ω			BTS-1000		R54	2500Ω	BTS-2500	
R26	750Ω			PW4-750		R55	2500Ω	BTS-2500	
R27	250Ω			BTS-250		R56	2500Ω	BTS-2500	
R28	33K			BTS-33K		R57	4000Ω	BTS-4000	
R29	6800Ω			BTS-6800		R58	18Ω	BTS-18	
R30	220Ω			BTS-220		R59	82K	BTS-82K	
R31	180Ω			BTS-180		R58	22K	BTS-22K	

Note #1. Not Used in Some Versions.

## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	H. H. SCOTT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ④ .38A	400VCT ④ .050A	8.3VAC ④ .55A	8.3VAC ④ 2.8A	TR-8-25					

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA				NOTES
		H. H. SCOTT PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil					
L2	RF Choke		19-1000	BC-561	4602	1, 2 Microhenries .39 Microhenries 1 Microhenry
L3	RF Choke		19-1000	BC-561	4585	
L4	RF Choke				4602	
L5	RF Coil					
L6	Osc. Coil					
L7	1st IF	18-3487	FM-254	FM-254	1463	
L8	2nd IF	18-3487	FM-254	FM-254	1463	
L9	3rd IF	18-3487	FM-254	FM-254	1463	
L10	4th IF	18-3487	FM-254	FM-254	1463	
L11	Limiter Grid Coil	19-3075	TV-186	TV-186	6172	
L12	Limiter Grid Coil					80 Microhenries
L13	Ratio Det.	17-3498	FM-255	FM-255	1465	
L14	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L15	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L16	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L17	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L18	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L19	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L20	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry
L21	Fl. Choke	19-1000	BC-561	BC-561	4602	1 Microhenry

## PARTS LIST AND DESCRIPTIONS (Continued)

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			H. H. SCOTT PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	3AG	1 1/4A (125V) S/B			3131.25 (3AG-1 1/4 S/B)	342003	MDL	HCM

### CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		H. H. SCOTT PART No.	CBS PART No.	SYLVANIA PART No.	
M2	1N294		1N54A	1N34A	Ratio Det. (Pigtail)
M3	1N294		1N54A	1N34A	
M4	1N294		1N54A	1N34A	

### MISCELLANEOUS

ITEM No.	PART NAME	H. H. SCOTT PART No.	NOTES
M5	Dial Light		
M6	Meter		#47 Tuning

# ALIGNMENT INSTRUCTIONS

**ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

Short pin 9 of 6U8 (V2) to chassis thru complete alignment.

## FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .05MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (Unmod)	Point of non-interference	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5, A6, A7, A8	Adjust of maximum deflection.
2. "	High side to pin 2 (grid) of 6BN6 (V8). Low side to chassis.	"	"	DC probe to point (B). Common to chassis.	A10, A11	"
3. "	"	"	"	DC probe to point (C). Common to point (C).	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

## FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 80% modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1. .05MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (450KC Swp)	Point of Non-interference	Vert. Amp. to point (A). Low side to chassis.	A1, A2, A3, A4, A5, A6, A7, A8	Disconnect stabilizing capacitor (C3). Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2. "	High side to pin 2 (grid) of 6BN6 (V8). Low side to chassis.	"	"	Vert. Amp. to point (B). Low side to chassis.	A10, A11	"
3. "	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A9	Reconnect stabilizing capacitor (C3). Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A10 for maximum amplitude and straightness of crossover lines.

## FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4. 270Ω Carbon Resistor	High side to antenna terminal. Low side to chassis.	108MC (Unmod)	108MC	DC probe to point (D). Common to chassis.	A12	Adjust for maximum deflection.
5. "	"	92MC	92MC	"	L6	Adjust for maximum deflection by compressing or expanding coil turns. Repeat steps 4 and 5 for proper tracking.
6. "	"	98MC	98MC	"	A13, A14	Adjust for maximum deflection.

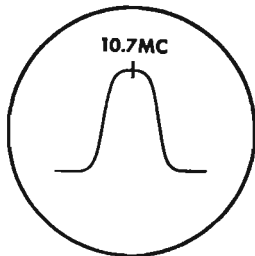


FIG. 1

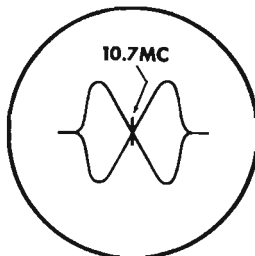
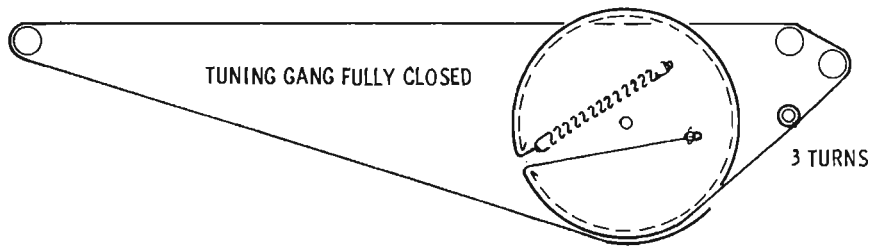


FIG. 2



SHERWOOD MODEL  
 S-2000

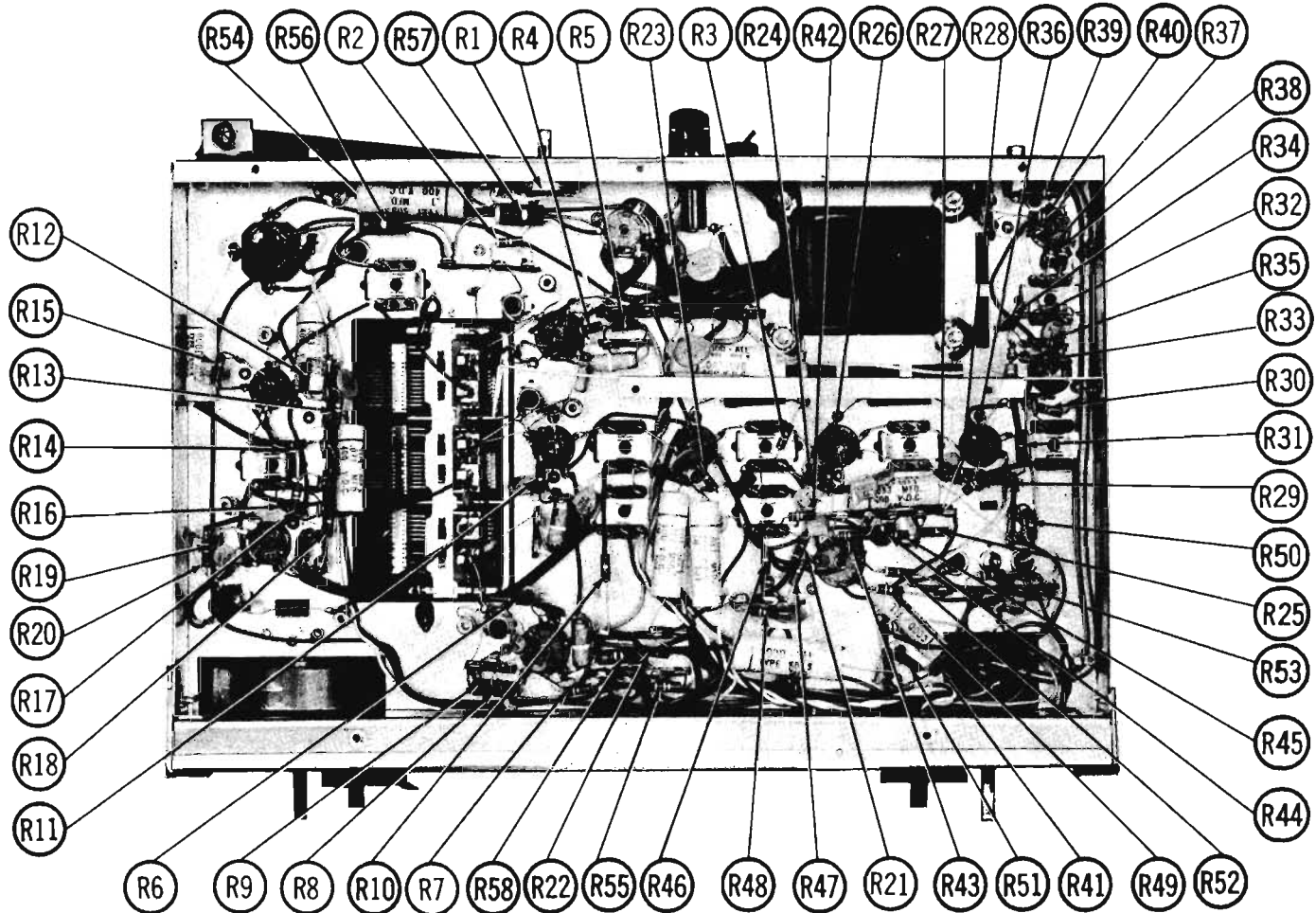
TRADE NAME	Sherwood Model S-2000		
MANUFACTURER	Sherwood Electronic Lab., Inc., 2802 W. Cullom Ave., Chicago 18, Illinois		
TYPE SET	AC Operated FM-AM Tuner		
TUBES	Thirteen		
POWER SUPPLY	110-120 Volts AC-50/60 Cycles	RATING	.45 Amp. @ 117 Volts AC (47 Watts)
TUNING RANGE—BROADCAST	530 - 1650KC	FREQ. MOD.	87.5 - 108.5MC



**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

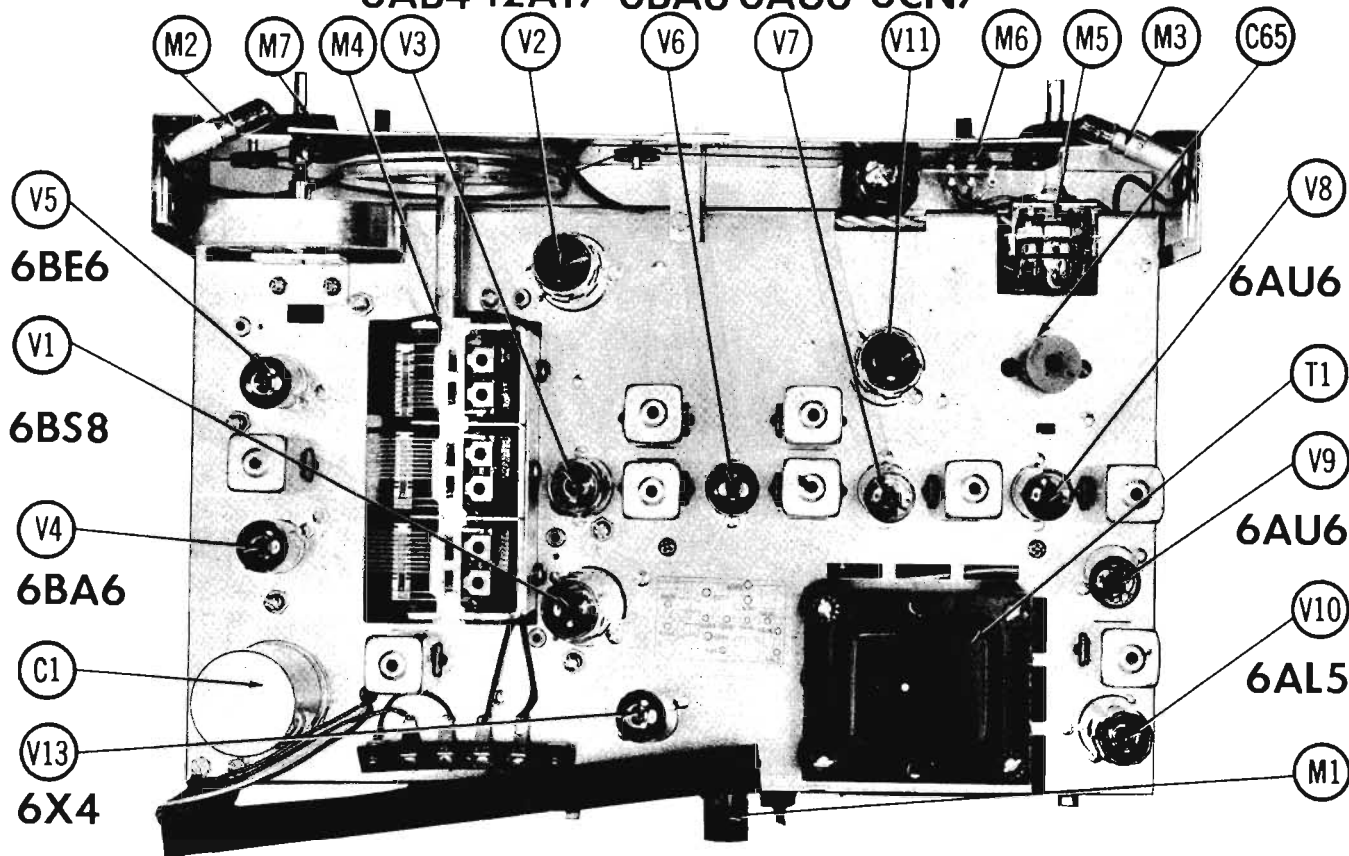
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H276

the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana. Printed in U.S. of America

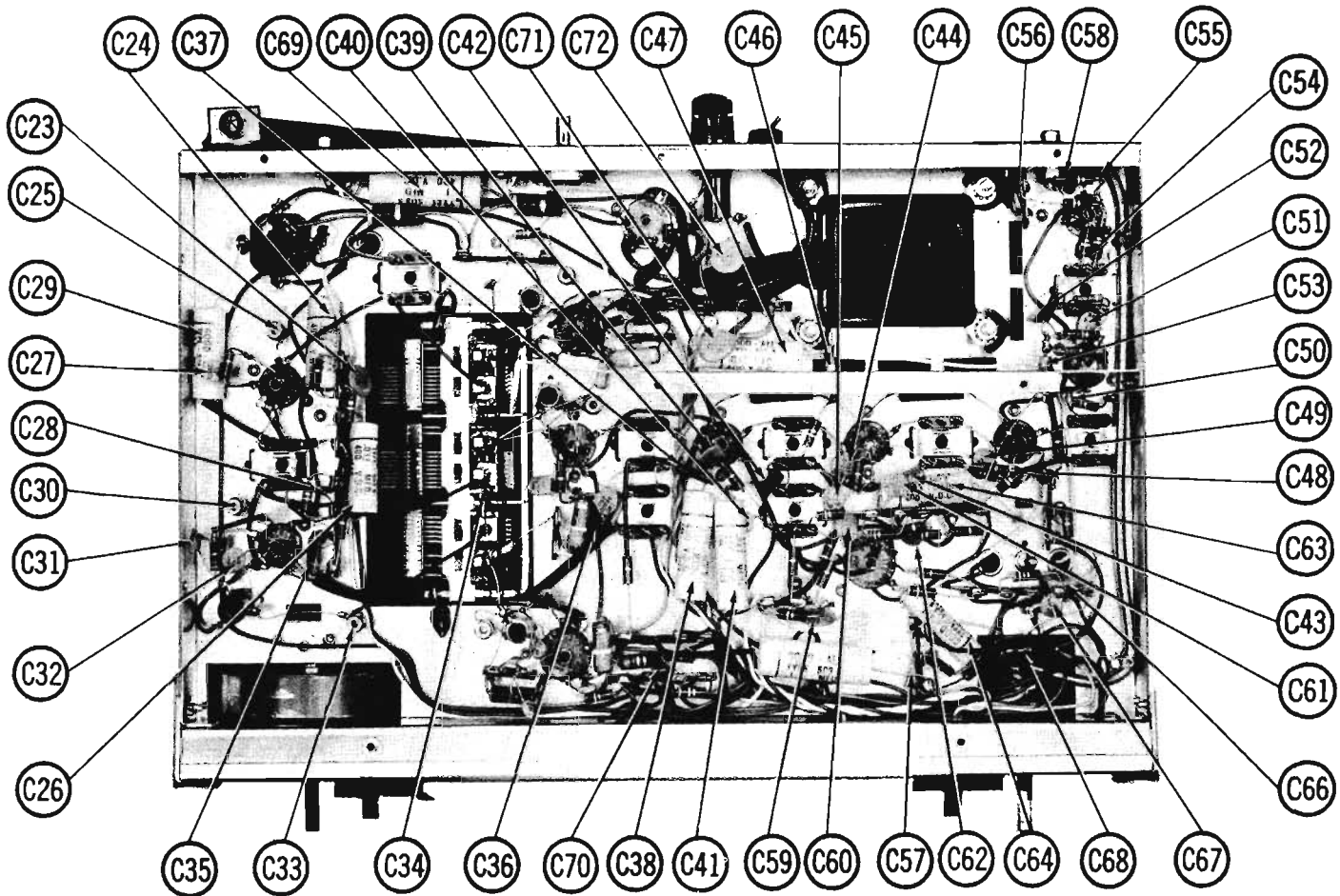


CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION

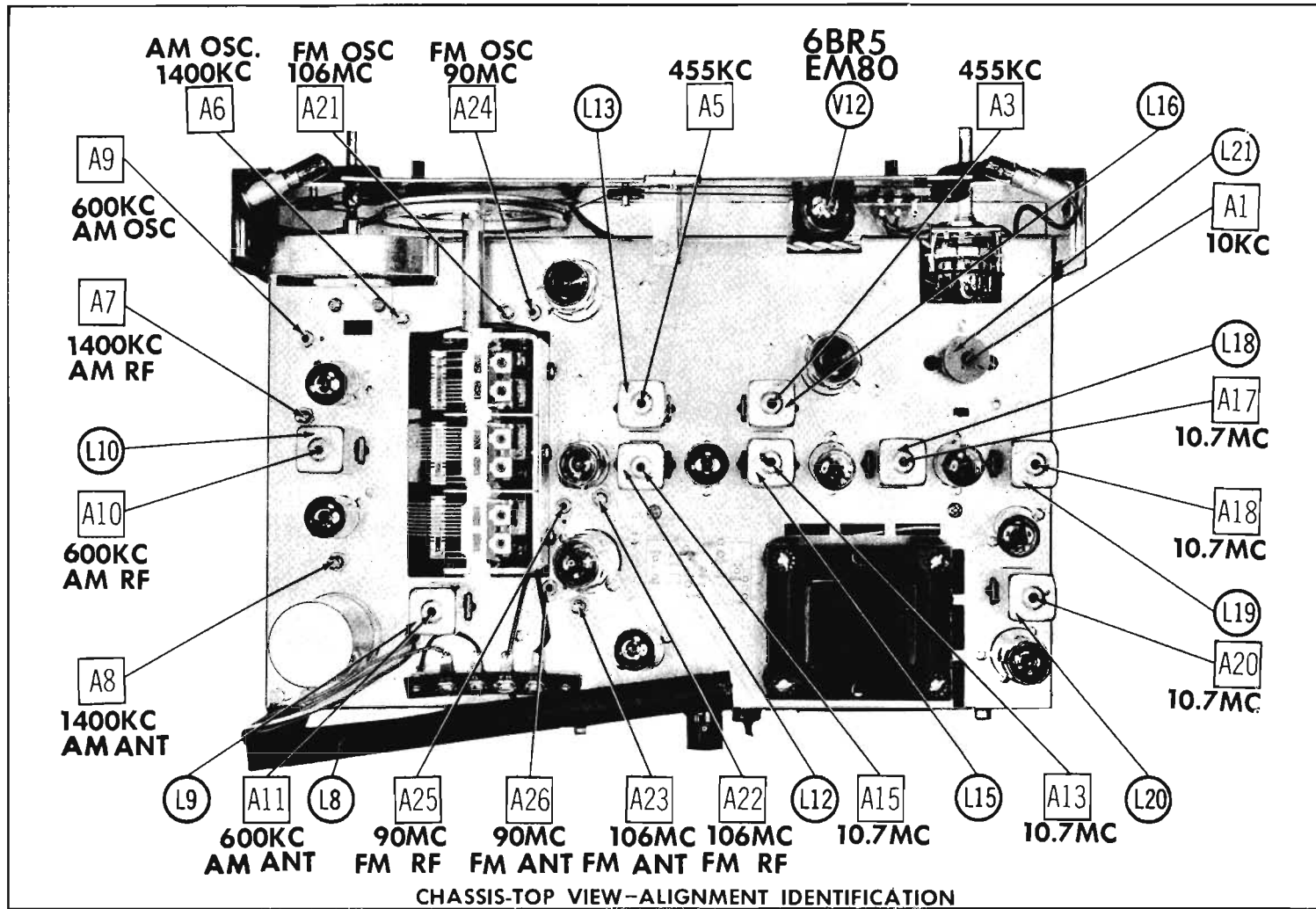
6AB4 12AT7 6BA6 6AU6 6CN7



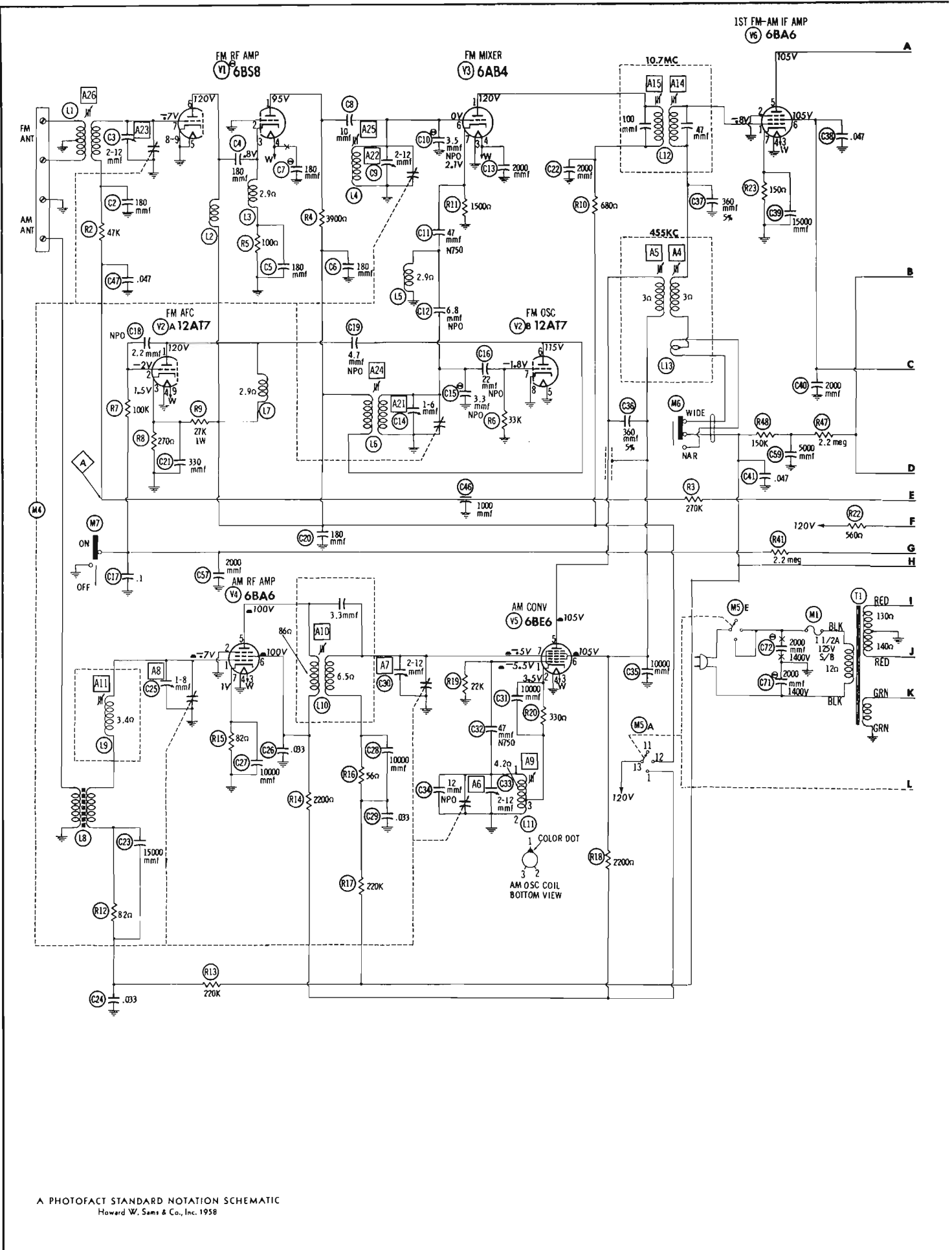
CHASSIS TOP VIEW



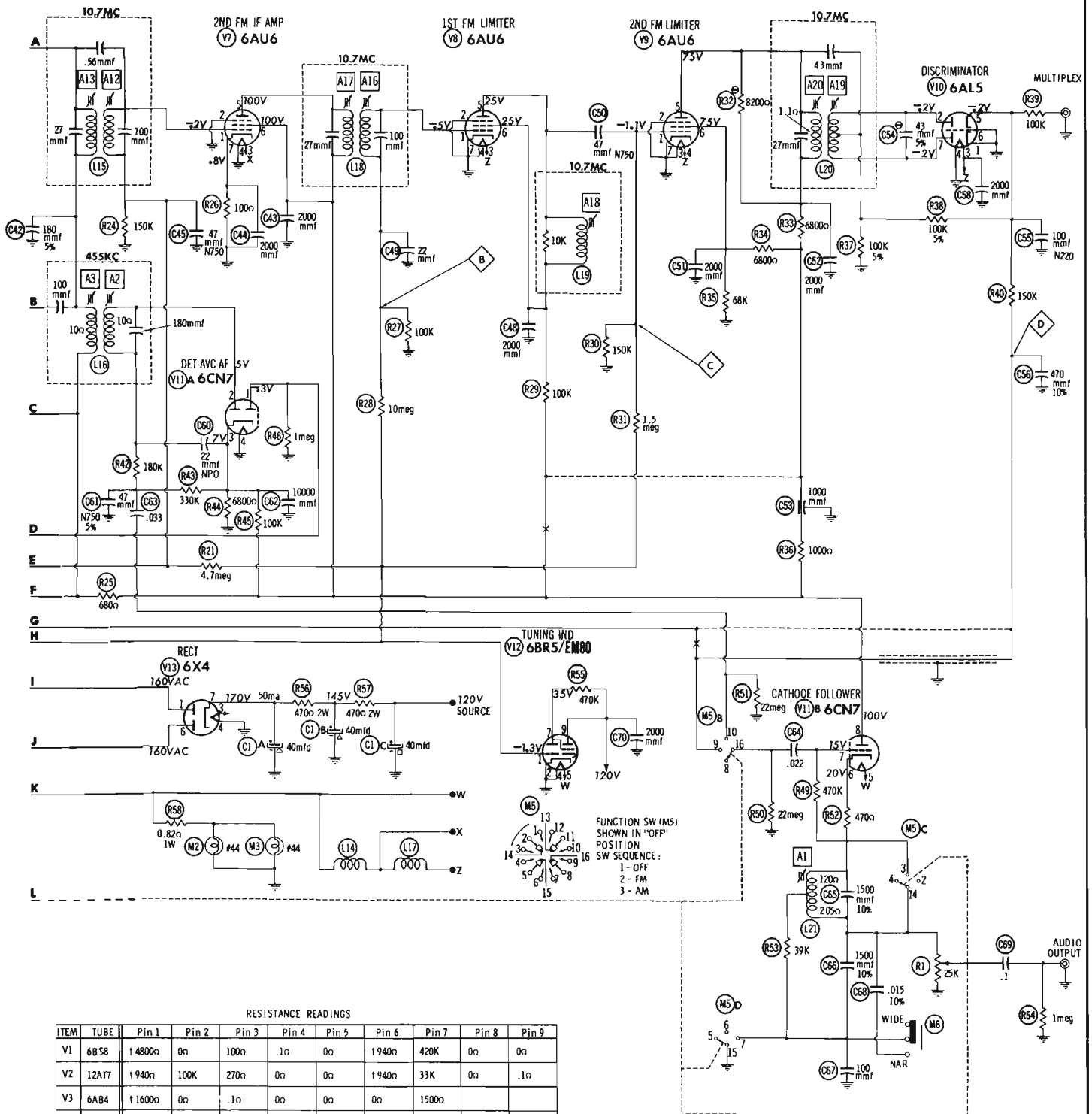
CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION







A PHOTOFAC STANDARD NOTATION SCHEMATIC  
Howard W. Sams & Co., Inc. 1958



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BS8	† 4800Ω	0Ω	100Ω	.1Ω	0Ω	† 940Ω	420K	0Ω	0Ω
V2	12A7	† 940Ω	100K	270Ω	0Ω	0Ω	† 940Ω	33K	0Ω	.1Ω
V3	6AB4	† 1600Ω	0Ω	.1Ω	0Ω	0Ω	0Ω	1500Ω		
V4	6BA6	-.1meg	0Ω	.1Ω	0Ω	† 3100Ω	† 3100Ω	82Ω		
V5	6BE6	-.22K	-.330Ω	.1Ω	0Ω	† 3100Ω	† 3100Ω	-.1meg		
V6	6BA6	1meg	0Ω	.1Ω	0Ω	† 1500Ω	† 1500Ω	150Ω		
V7	6AU6	130K	0Ω	.1Ω	0Ω	† 2200Ω	† 2200Ω	100Ω		
V8	6AU6	100K	0Ω	.1Ω	0Ω	† 1100K	† 1100K	0Ω		
V9	6AU6	130K	0Ω	0Ω	.1Ω	† 110K	† 110K	0Ω		
V10	6AL5	0Ω	100K	.1Ω	0Ω	200K	0Ω	100K		
V11	6CN7	750K	460K	6800Ω	0Ω	.1Ω	14K	480K	† 2200Ω	NC
V12	EM80	1meg	0Ω	† 940Ω	0Ω	.1Ω	NC	† 470K	† 940Ω	† 940Ω
V13	6X4	130Ω	NC	.1Ω	0Ω	0Ω	140Ω	20K(Min)		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED  
 † MEASURED FROM PIN 7 OF V3  
 Ω MEASURED IN "AM" POSITION  
 NC NO CONNECTION

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION  
 DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
- Volume control at maximum, no signal applied for voltage measurements.

# ALIGNMENT INSTRUCTIONS

## ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

### AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .02mfd	High side to pin 7 (grid) of 6CN7 (V1). Low side to chassis.	10KC	AM (Wide Band)	Point of non-interference	AC probe to audio output jack. Common to chassis.	A1	Adjust for zero reading.
2. .01mfd	High side to pin 7 (grid) of 6BE6 (V5). Low side to chassis.	455KC (400% Mod)	AM (Narrow Band)	Tuning gang fully open	"	A2, A3, A4, A5	Adjust for maximum deflection.
3. 220mmf	Across AM antenna terminals.	1400KC	AM	1400KC	"	A6, A7, A8	Adjust for maximum deflection.
4. "	"	600KC	"	600KC	"	A9, A10, A11	Adjust for maximum deflection. Repeat steps 3 and 4 until no further improvement can be obtained.

### FM IF ALIGNMENT USING AM SIGNAL GENERATOR & VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5. .01mfd	High side to pin 6 (grid) of 6AB4 (V3). Low side to chassis.	10.7MC (Unmod)	FM AFC off	Point of non-interference	DC probe to point (A). Common to chassis.	A12, A13, A14, A5	Adjust for maximum deflection.
6. "	"	"	"	"	DC probe to point (B). Common to chassis.	A16, A17	"
7. "	"	"	"	"	DC probe through 100K to point (C). Common to chassis.	A18	"
8. "	"	"	"	"	DC probe to point (D). Common to chassis.	A19	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
9. "	"	"	"	"	"	A20	Adjust for maximum deflection.

### FM IF ALIGNMENT USING FM SIGNAL GENERATOR & OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120V sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5. .01mfd	High side to pin 6 (grid) of 6AB4 (V3). Low side to chassis.	10.7MC (450KC Swp)	FM AFC off	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A12, A13, A14, A15	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
6. "	"	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A16, A17	"
7. "	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A18	"
9. "	"	"	"	"	Vert. Amp. to point (D). Low side to chassis.	A19	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2.
9. "	"	"	"	"	"	A20	Adjust for maximum amplitude and straightness of crossover lines similar to Fig. 2.

### FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
10. Two 1200 Carbon Resistors	Across FM antenna terminals	106MC	FM AFC off	Point of non-interference	AC probe to audio output jack. Common to chassis.	A21, A22, A23	Adjust for maximum deflection.
11. "	"	90MC	"	"	"	A24, A25, A26	Adjust for maximum deflection. Repeat steps 10 and 11 until no further improvement can be obtained.

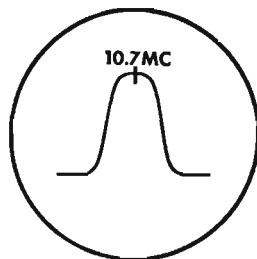


FIG. 1

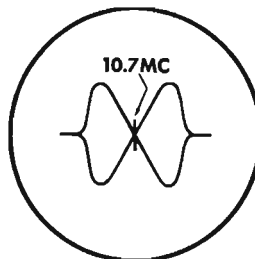
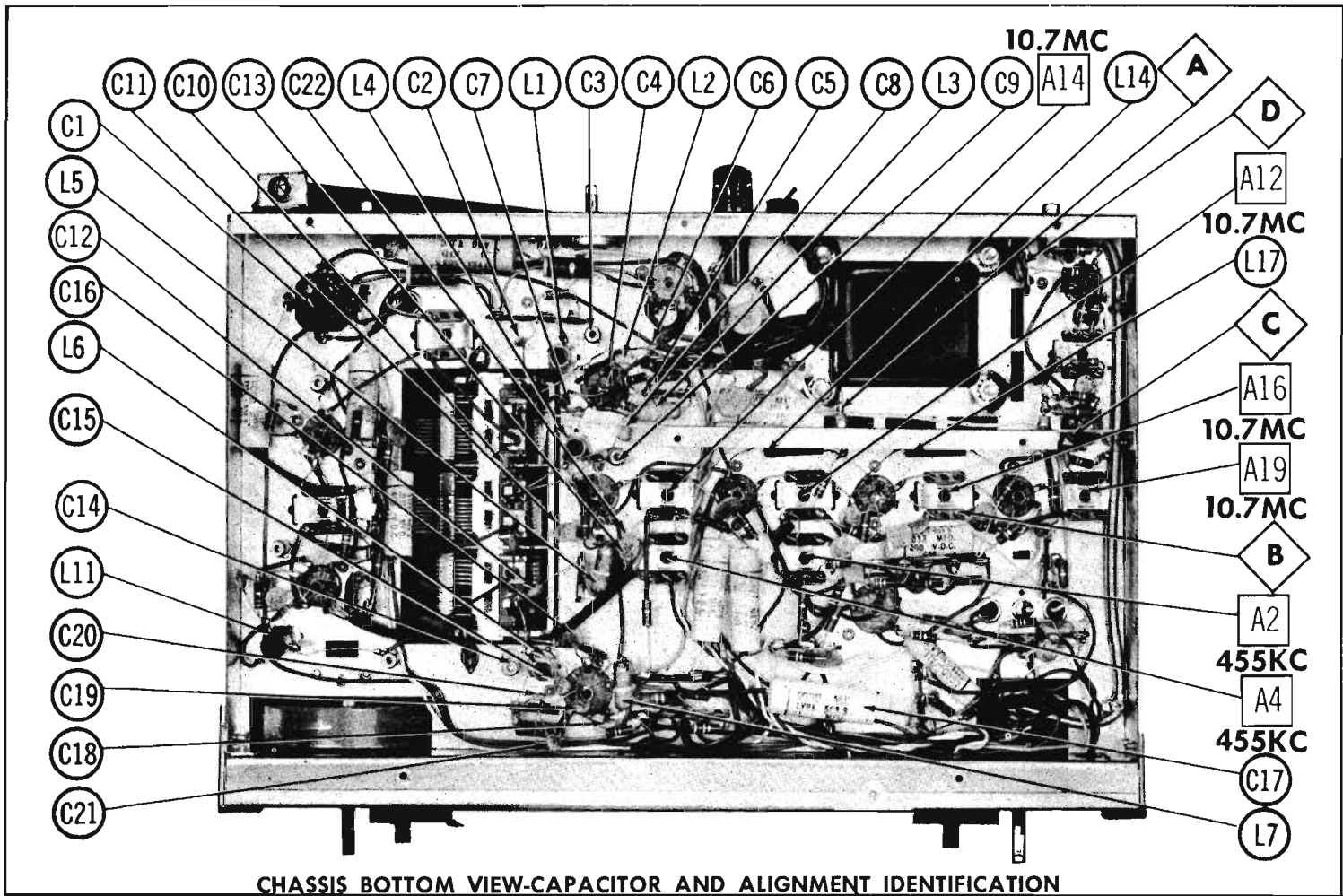


FIG. 2



## PARTS LIST AND DESCRIPTIONS

## TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	8B56	Note 1	V8	1st FM Limiter	6AU6	
V2	FM Osc. - AFC	12AT7		V9	2nd FM Limiter	6AU6	
V3	FM Mixer	6BA4		V10	Discriminator	6AL5	
V4	AM RF Amplifier	8BA6		V11	AM Det. - AVC - Cath. Follower	6CN7	
V5	FM Converter	8B56		V12	Tuning Indicator	8BRS/8M90	
V6	FM AM IF Amplifier	8BA6		V13	Rectifier	6X4	
V7	2nd FM IF Amplifier	6AU6					

Note 1. Alternate type 6CB7/6BZ7

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	SBERWOOD PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	350							R2478 *
B	40	350							
C	40	350							

\* Non Catalog Item

## FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	SBERWOOD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C2	180		81 180	DD-181	L10T18	ED-180			5GA-T18		
C3	2-12										
C4	180		81 180	DD-181	L10T18	ED-180			5GA-T18		
C5	180		81 180	DD-181	L10T18	ED-180			5GA-T18		
C6	180		81 180	DD-181	L10T18	ED-180			5GA-T18		
C7	180		81 180	DD-181	L10T18	ED-180			5GA-T18		
C8	10		81 10	D6-100	L76QJ	ED-100		UC-641	5GA-QJ	①	
C9	2-12										
C10	3.5		NPO-DI 3.3		C10V33C	TCCO-3.3	ZT-5533	5TCCB-V33	② NPO		
C11	47		N750-DI 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47	N750		
C12	6.8		NPO-DI 6.8	TCZ-22	C10Q22C	TCCO-6.8	ZT-5588	5TCCB-V68	NPO		
C13	2000		BPD-002	DD-202	BYA10D2	ED-002	DC522	5BK-D2			
C14	1-8		829-7			532-B					
C15	3.3		NPO-DI 3.3	TCZ-3R3	C10V33C	TCCO-3.3	ZT-5533	5TCCB-V33	② NPO		
C16	22		NPO-DI 22	TCZ-22	C10Q22C	TCCO-22					
C17	1.1	400	P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	NPO		
C18	2.2		NPO-SI 2.2	TCZ-2R2	C10V22C	TCCO-2.2	ZT-5547	5TCCB-V22	NPO		
C19	4.7		NPO-DI 4.7	TCZ-4R7	C10V47C	TCCO-4.7		5TCCB-V47	NPO		
C20	180		81 180	DD-181	L10T18	ED-180		5GA-T18			
C21	330		BPD-00033	DD-331	L10T33	ED-330	UC-5333	5GA-T33			
C22	2000		BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2			
C23	15000		BPD-015	DD-6E-153	BYA10S15	ED-015		5HK-S15			
C24	0.33	400	P488N-033	DF-303	CUB833		GEM-4133	6TM-S33			
C25	1-8					532-B					
C26	0.33	400	P488N-033	DF-303	CUB833		GEM-4133	6TM-S33			
C27	10000		BPD-01	DD-103	BYA8S1	ED-01	DC511	5BK-S1			
C28	10000		BPD-01	DD-103	BYA8S1	ED-01	DC511	5BK-S1			
C29	0.33	400	P488N-033	DF-303	CUB833		GEM-4133	6TM-S33			
C30	2-12										
C31	1000		BPD-01	DD-103	BYA8S1	ED-01	DC511	5BK-S1			
C32	47		N760-DI 47	TCN-47	C10Q47U	TC7-47	NT-5447	5TCU-Q47	N750		
C33	2-12										
C34	12				TCZ-12	C10Q12C	TCCO-12			NPO	

## PARTS LIST AND DESCRIPTIONS (Continued)

## CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	SBERWOOD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C35	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1		
C36	380			1469-00038		5R5T38		CY15C38U7	MS-338	5%	
C37	380			1469-00038		5R5T38		CY15C38U7	MS-338	5%	
C38	0.47			P488N-047	DF-503	CUB4S47					
C39	15000			BPD-015	DD-153	BYA10S15	ED-015	GEM-4147	4TM-S47		
C40	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C41	0.047	400		P488N-047	DF-503	CUB4S47		GEM-4147	4TM-S47		
C42	180			1469-00018	TCZ-180	5R5T38	TCO-180	MS-318		5%	
C43	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C44	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C45	47				TCN-47			5TCU-Q47		N750 5%	
C46	1000			EF-001	MFT-1000			503C-D1			
C47	0.047			P488N-047	DF-403	CUB4S47		GEM-4147	4TM-S47		
C48	2000	400		BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C49	22			BPD-000022	DD-220	L10Q22	ED-22	UC-5422	5GA-Q22	N750	
C50	47			N750-DI 47	TCN-47	C10Q47T	TC7-47	NT-5447	5TCU-Q47		
C51	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C52	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C53	1000			EF-001	MFT-1000			603C-D1			
C54	43			1469-000043		22R5Q43	TCO-43	MS-443		③ 5% N720	
C55	100										
C56	470										
C57	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C58	2000			BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C59	5000			BPD-005	DD-502	BYA10D5	ED-005	5HK-D5			
C60	22			NPO-DI 22	TCZ-22	C10Q22C	TCO-22	5TCC-Q22		NPO	
C61	47				TCN-47			5TCU-Q47			
C62	822	10000		BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1		
C63	0.33	400		P488N-033	DF-303	CUB633		GEM-4133	6TM-S33		
C64	0.22	400		P488N-022	DD-203	CUB4822	ED-02	GEM-4122	4TM-S22		
C65	1500				1R8D15	ED-1500		MS-215		10%	
C66	1500				1R8D15	ED-1500		MS-215		10%	
C67	100			BPD-0001	DD-101	L10T1	ED-100	UC-591	5GA-T1	10%	
C68	0.15	400									
C69	1	400		P488N-1	DF-104	CUB4P1		GEM-401	4TM-P1	10%	
C70	2000	1400		BPD-002	DD-202	BYA10D2	ED-002	DC522	5HK-D2		
C71	2000	1400		DAC-3	DD30-202	HVC16D2	HD15-2200	DC30222	MB-D2	④	
C72	2000	1400		DAC-3	DD30-202	HVC16D2	HD15-2200	DC30222	MB-D2	④	

① Not used in some versions.

② Some versions use 3.9mmf in this application.

③ Some versions use 47mmf in this application.

④ Some versions use 5000mmf in this application.

## CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	SBERWOOD PART No.	CENTRALAB PART No.	CLAROSTAR PART No.	IRC PART No.	MALLORY PART No.	
RIA	25K	1/2	670AD4	B-26	A47-25K-8	B11-120	TA253L	Audio Level
B	Start			Not Req.	FKS-1/4	TM2-K1L	Not Req.	

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		SBERWOOD PART No.	NOTES	ITEM No.	RATING		SBERWOOD PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R2	47K				R9	27K	1		
R3	270K				R10	800R			
R4	3900R				R11	1500R			
R5	100R				R12	82R			
R6	33K				R13	220K			
R7	100K				R14	2200R			
R8	270R				R15	82R			

## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS (cont)

ITEM No.	RATING		SHERWOOD PART No.	NOTES	ITEM No.	RATING		SHERWOOD PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R18	56Ω				R38	100K	5%		
R17	220K				R39	100K			
R18	2200Ω				R40	150K			
R19	22K				R41	2.2meg			
R20	330Ω				R42	180K			
R21	4.7meg				R43	330K			
R22	500Ω				R44	6800Ω			
R23	150Ω				R45	100K			
R24	150K				R46	1meg			
R25	680Ω				R47	2.2meg			
R26	100Ω				R48	150Ω			
R27	100K				R49	470K			
R28	10meg				R50	22meg			
R29	100K				R51	22meg			
R30	150K				R52	470Ω			
R31	1.5meg				R53	59K			
R32	8200Ω			Note 1	R54	1meg			
R33	6800Ω				R55	470K			
R34	6800Ω				R56	470Ω	2		
R35	68K				R57	470Ω	3		
R36	1000Ω				R58	0.5Ω	1		
R37	100K 5%								

Note 1. Some versions may use 27K in this application.

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	SHERWOOD PART No.	Haldorson PART No.	Merit PART No.	Rom PART No.	Siancor PART No.	Thordarson PART No.	Triod PART No.
T1	117V ⊖ .45A	320VCT ⊖ .050A	6.3V ⊖ 4.5A	822AG1						

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		SHERWOOD PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.	
L1	FM Ant. Trans.		19-1000	BC-561	4608		1 Microhenry
L2	RF Choke		19-1003	BC-564	4608		3.9 Microhenries; IRC Part #CLA
L3	Cathode Choke						
L4	FM Mixer Coll		19-1003	BC-564	4608		3.9 Microhenries; IRC Part #CLA
L5	RF Choke						
L6	FM Osc. Coll		19-1003	BC-564	4608		3.9 Microhenries; IRC Part #CLA
L7	RF Choke						
L8	Loop Stick						
L9	AM Ant. Coll						
L10	AM RF Trans.		14-1410				
L11	AM Osc. Coll						
L12	1st FM IF		16-3487	FM-254	1463		
L13	1st AM IF						
L14	FL. Choke		19-1002	BC-563	4606		2.5 Microhenries
L15	2nd FM IF		16-3487	FM-254	1463		
L16	2nd AM IF						
L17	FL. Choke		19-1002	BC-563	4606		2.5 Microhenries
L18	3rd FM IF						
L19	FM Limiter						
L20	FM Discriminator		17-3494	FM-253	1464		
L21	10K Filter						

## PARTS LIST AND DESCRIPTIONS (Continued)

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			SHERWOOD PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	1 1/2 125V 5/8			3130L 5 3AG 1 1/2 125V Slo Blo	342001	MDL 1 1/2	HXP

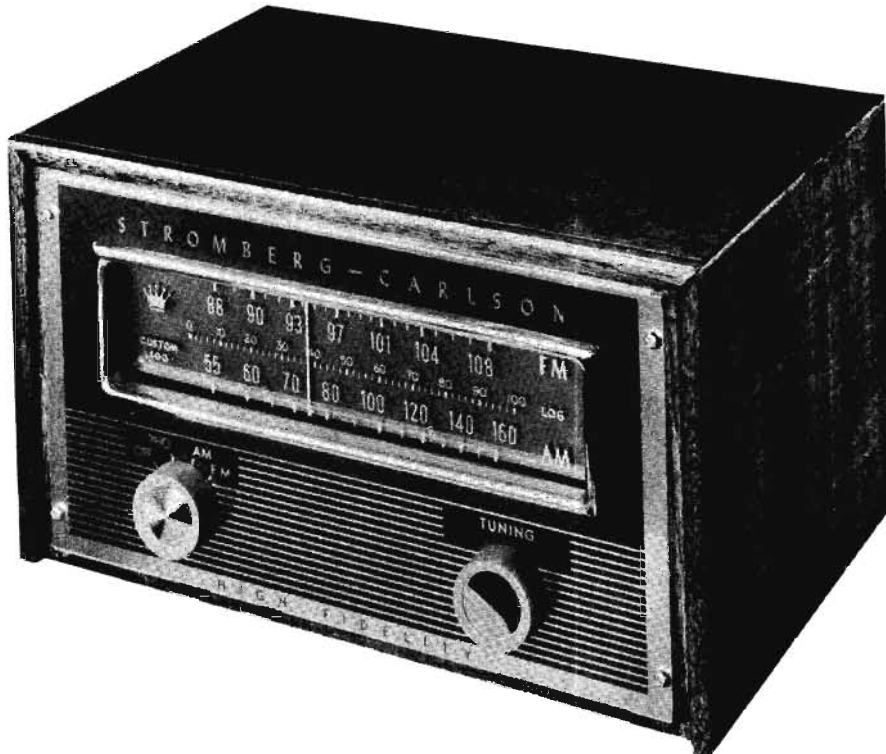
### MISCELLANEOUS

ITEM No.	PART NAME	SHERWOOD PART No.	NOTES
M2	Dial Lamp		#44
M3	Dial Lamp		#44
M4	Tuning Cap.		6 Gang (Am Sections: Ant. 10-370mmf, RF 10-362mmf, Osc. 6-150mmf) Selector (Rotary, Wafer Type)
M5	Switch		AM Wide-Narrow (Slide Type, SPDY)
M6	Switch		FM AFC (Slide Type, SPDY)
M7	Switch		

### WIRING DATA

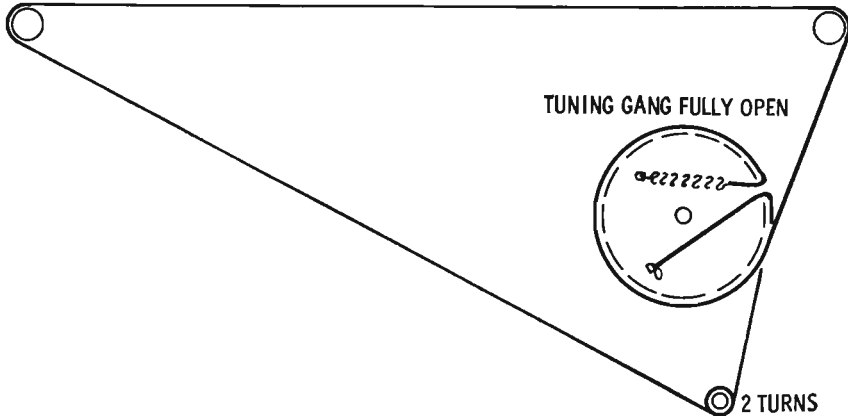
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7 1/2 Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)





**STROMBERG-CARLSON  
 MODEL SR-403B**

TRADE NAME	Stromberg-Carlson Model SR-403B	
MANUFACTURER	Stromberg-Carlson Co., National Service Dept., 1400 N. Goodman St., Rochester 3, N.Y.	
TYPE SET	AC Operated FM-AM Tuner	
TUBES (Eight)	Types 6BK7A FM RF Amplifier, 6U8 FM Mixer-FM Osc., 6BE6 AM Converter, 6BA6 1st. FM AM IF Amp., 6AU6 2nd. FM IF Amplifier, 6AL5 Ratio Detector, 6AT6 FM AVC Delay-AM Det. -AVC-AF Amp., 6X4 Rectifier	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .41 Amp. @ 117 Volts AC (40 Watts)
TUNING RANGE-BROADCAST	540-1600KC	FREQ. MOD. 88-108MC

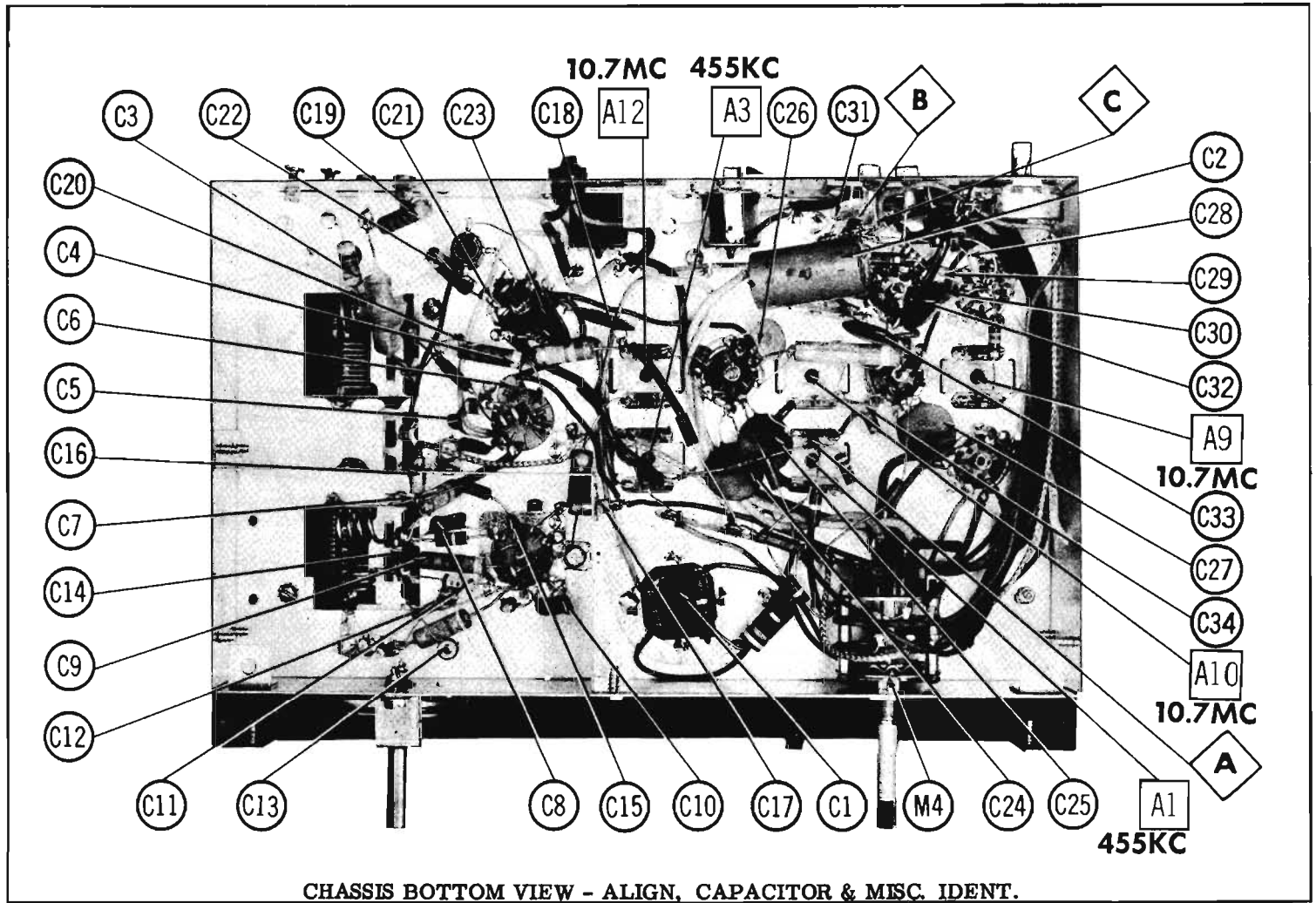


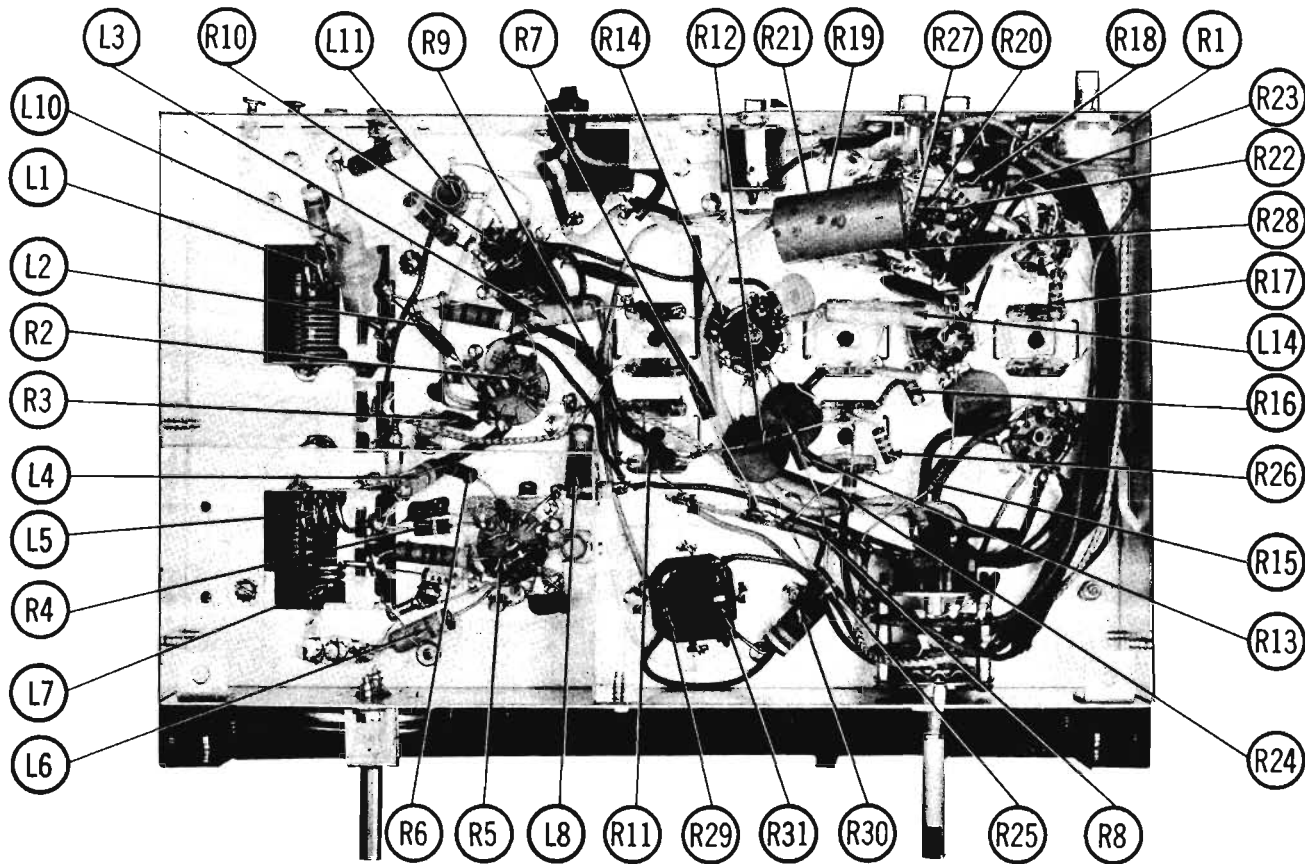
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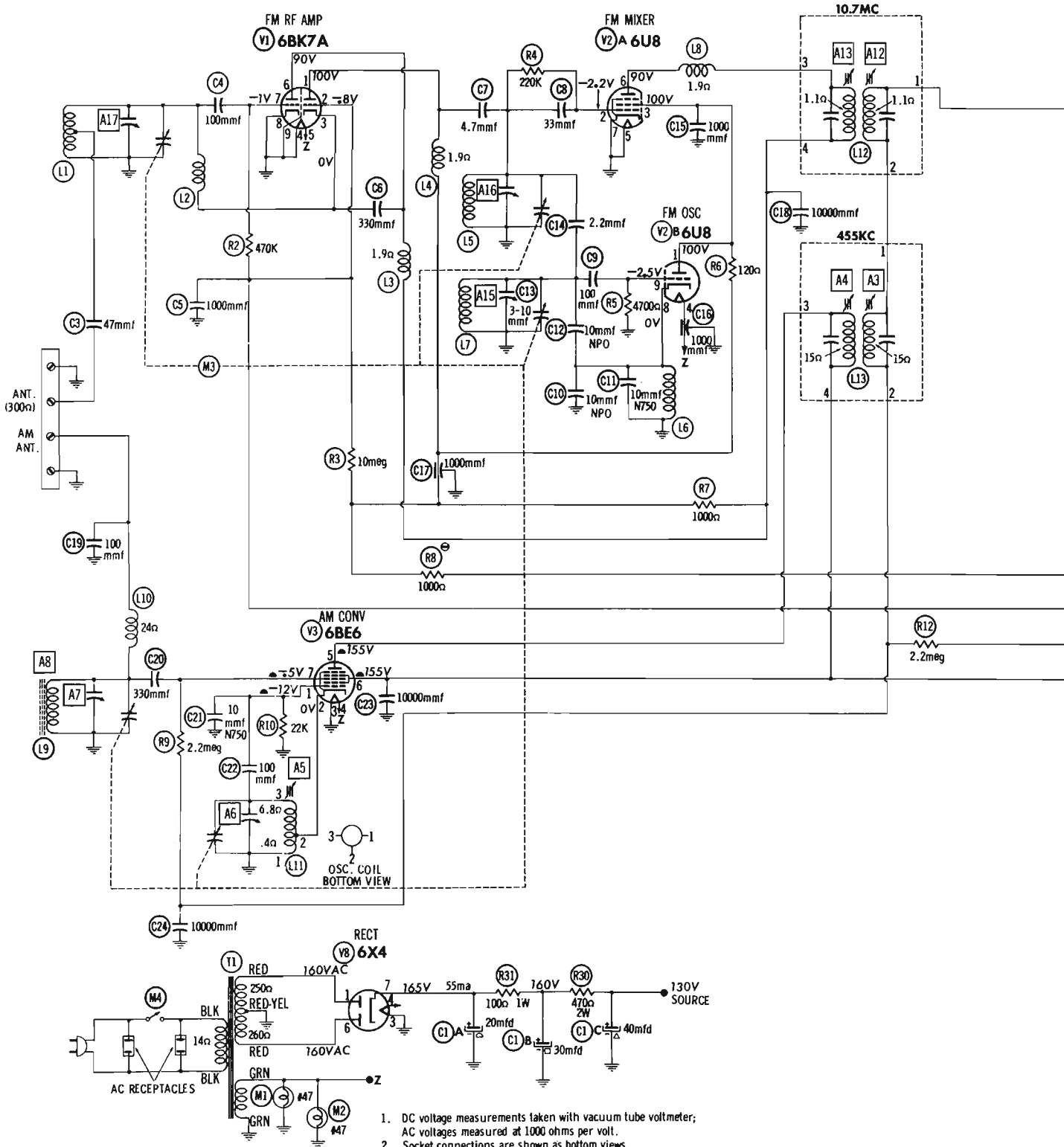
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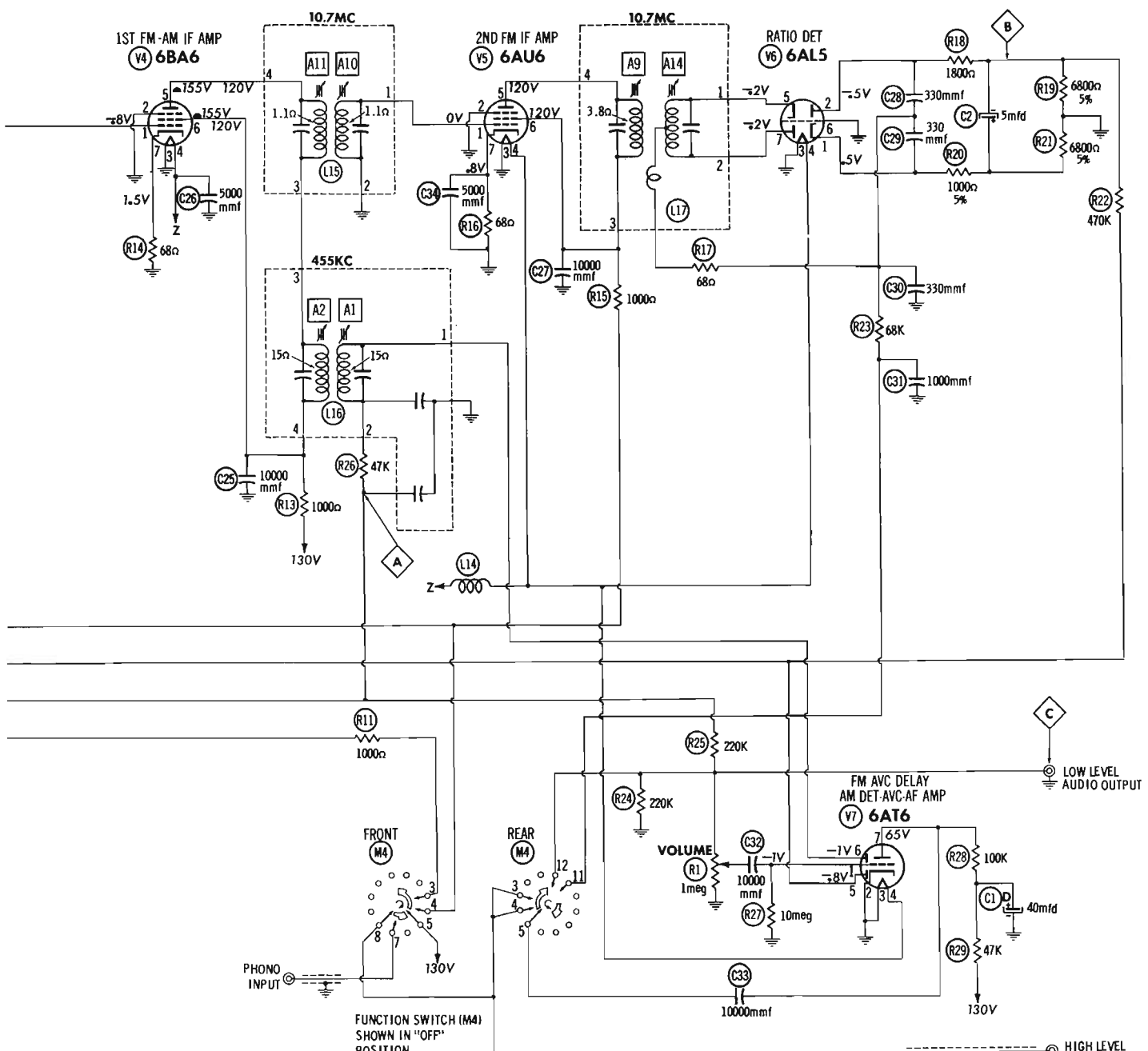


CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
  2. Socket connections are shown as bottom views.
  3. Measured values are from socket pin to common negative.
  4. Line voltage maintained at 117 volts for voltage readings.
  5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
  6. Volume control at maximum, no signal applied for voltage measurements.
- ⊕ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
- DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFAC STANDARD NOTATION SCHEMATIC  
 Howard W. Sams & Co., Inc. 1958



FUNCTION SWITCH (M4)  
SHOWN IN "OFF"  
POSITION.  
SWITCH SEQUENCE:  
1. OFF  
2. PHONO  
3. AM  
4. FM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BK7A	†1600Ω	360K	.1Ω	0Ω	.1Ω	†2600Ω	750K	0Ω	0Ω
V2	6U8	†1700Ω	220K	†1700Ω	.1Ω	0Ω	†2600Ω	0Ω	.2Ω	4700Ω
V3	6BE6	≈22K	≈.4Ω	0Ω	.1Ω	≈†1600Ω	≈†1600Ω	≈4.6meg		
V4	6BA6	2.6meg	0Ω	0Ω	.1Ω	†1600Ω	†1600Ω	68Ω		
V5	6AU6	1.1Ω	0Ω	0Ω	.1Ω	†1600Ω	†1600Ω	68Ω		
V6	6AL5	7800Ω	8600Ω	0Ω	.1Ω	230K	0Ω	230K		
V7	6AT6	10meg	0Ω	0Ω	.1Ω	360K	450K	†147K		
V8	6X4	250Ω	NC	0Ω	.1Ω	NC	260Ω	20K(Min)		

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED  
 ▲ MEASURED IN "AM" POSITION  
 † MEASURED FROM PIN 7 OF V8  
 NC NO CONNECTION

# ALIGNMENT INSTRUCTIONS

## PRE-ALIGNMENT INSTRUCTIONS

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting. To set pointer, close tuning gang and adjust pointer to "O" on logging scale.

## AM ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .1mfd	High side to pin 7 (grid) of 6BE6 (V3). Low side to chassis.	455KC (400% Mod)	AM	Point of non-interference at low end of dial.	DC probe to point $\odot$ . Common to chassis.	A1, A2, A3, A4	Adjust for maximum deflection.
2. Direct	Loop	800KC	"	800KC	AC probe to high level audio output. Low side to chassis.	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3. "	"	1400KC	"	1400KC	"	A6, A7	"
4. "	"	800KC	"	800KC	"	A5, A8	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. Repeat steps 3 and 4 until proper tracking is obtained.

## FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5. .1mfd	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (Unmod)	FM	100MC	DC probe to point $\oplus$ . Common to chassis.	A9, A10, A11, A12, A13	Adjust for maximum deflection.
6. "	"	"	"	"	DC probe to low level audio output. Common to chassis.	A14	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

## FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND SCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5. .1mfd	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (450KC Swp)	FM	100MC	Vert. Amp. to point $\oplus$ . Low side to chassis.	A9, A10, A11, A12, A13	Disconnect stabilizing capacitor (C2). Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
6. "	"	"	"	"	Vert. Amp. to low level audio output. Low side to chassis.	A14	Reconnect capacitor (C2). Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY re-touch A9 for maximum amplitude and straightness of crossover lines.

## FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7. 270 $\Omega$ Carbon Resistor	Across FM ant. terminals with 270 $\Omega$ in high side.	100MC	FM	100MC	DC probe to point $\odot$ . Common to chassis.	A15, A16, A17	Adjust for maximum deflection.
8.	Check dial calibration and sensitivity at 108MC, 106MC, 90MC and 88MC as compared with 100MC (Step 7). If variation is excessive, SLIGHTLY compress or expand L7, L5 and L1. Repeat steps 7 and 8 until proper tracking is obtained.						

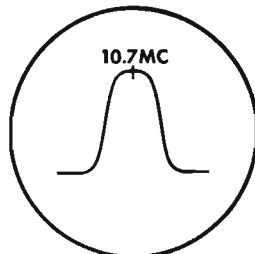


FIG. 1

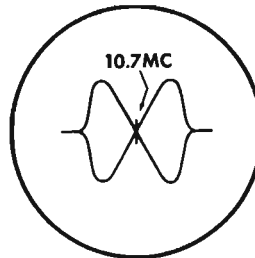


FIG. 2

## PARTS LIST AND DESCRIPTIONS

### TUBES ( GENERAL ELECTRIC, SYLVANIA )

ITEM No.	USE	TYPE	NOTES	ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6BK7A		V5	2nd. FM IF Amp.	6AU6	
V2	FM Mixer-FM Oec.	6U8		V6	Ratio Detector	6AL5	
V3	AM Converter	6BE6		V7	FM AVC Delay-AM Det. - AVC-AF Amp.	6AT6	
V4	1st. FM AM IF Amp.	6BA6		V8	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						SPRAGUE PART No.
	CAP.	VOLT.	Stromberg-Carlson PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	.20	250	111825-000	AFH4-02-10	D0022	FP419.5	TMQ-116	Q-345 MT-4540	TVL-4580
C1B	.30	250							
C1C	.40	200							
C1D	.40	200							
C2	5	50	111093-000	PR850V5	BBR5-50	TC30	TD-5-50	MT-0504	TVA-1303

### FIXED CAPACITORS

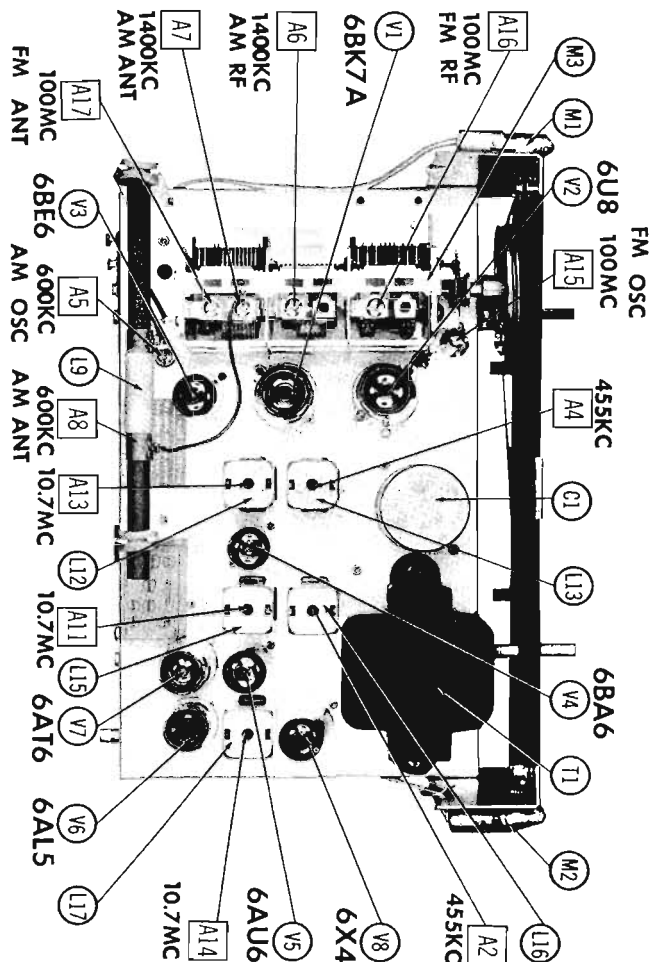
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	Stromberg-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	
C3	47	100		SI 47	D8-470	LT6Q47	GP-47	UC-5447	5GA-Q47
C4	100	1000		SI 100	D8-101	LT6T1	GP-100	UC-631	5GA-T1
C5	1000			BPD-001	DD-102	BYA8D1	ED-1000	DC521	5HK-D1
C6	330			BPD-00033	DD-331	LT0T33	ED-330	UC-5333	5GA-T33
C7	4.7			NPO-SI 4.7	TCZ-4R7	C10V47C	TCO-4.7	ZT-5547	5TCCB-V47
C8	33			SI 33	D8-330	LT6Q33	GP-33	UC-5433	5GA-Q33
C9	100			SI 100	D8-101	LT6T1	GP-100	UC-631	5GA-T1
C10	10			NPO-SI 10	TCZ-10	CTA8Q10C	TCO-10	ZT-541	5TCC-Q8
C11	10			N750-SI 10	TCN-10	CTA8Q10C	TCO-10	NT-541	5TCU-Q1
C12	10			NPO-SI 10	TCZ-10	CTA8Q10C	TCO-10	ZT-541	5TCC-Q8
C13	3-10		110853-000						
C14	2.2			NPO-SI 2.2	TCZ-2R2	C10V22C	TCO-2.2		5TCCB-V22
C15	1000			BPD-001	DD-102	BYA8D1	ED-1000	DC521	5HK-D1
C16	1000		110893-000	FT-001	MFT-1000				503C-D1
C17	1000		110893-000	FT-001	MFT-1000				503C-D1
C18	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C19	100			SI 100	D8-101	LT6T1	GP-100	UC-531	5GA-T1
C20	330			SI 330	D8-331	LT6T33	GP-330	UC-5333	5GA-T33
C21	10			N750-SI 10	TCN-10	CTA8Q10C	TCO-10	NT-541	5TCU-Q1
C22	100			SI 100	D8-101	LT6T1	GP-100	UC-531	5GA-T1
C23	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C24	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C25	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C26	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5
C27	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C28	330			BPD-00033	DD-331	LT0T33	ED-330	UC-5333	5GA-T33
C29	330			BPD-00033	DD-331	LT0T33	ED-330	UC-5333	5GA-T33
C30	330			BPD-00033	DD-331	LT0T33	ED-330	UC-5333	5GA-T33
C31	1000			BPD-001	DD-102	BYA8D1	ED-1000	DC521	5HK-D1
C32	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C33	10000			BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1
C34	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES
	RESISTANCE	WATTS	Stromberg-Carlson PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	
R1A	1meg	1/4	145209-000	BX-89	A47-1meg-Z	B13-137	TA16A
B	Shaft			Not Req.	FRB-1/4	TM2-R11	Not Req.

## CHASSIS-TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

## RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Stromberg-Carlson PART No.	NOTES	ITEM No.	RATING		Stromberg-Carlson PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R2	470K			Note 1	R17	88Ω			
R3	10meg				R18	1800Ω			
R4	220K				R19	6800Ω 5%			
R5	4700Ω				R20	1000Ω 5%			
R6	120Ω				R21	6800Ω 5%			
R7	1000Ω				R22	470K			
R8	1000Ω				R23	68K			
R9	2.2meg				R24	220K			
R10	22K				R25	220K			
R11	1000Ω				R26	47K			
R12	2.2meg				R27	10meg			
R13	1000Ω				R28	100K			
R14	88Ω				R29	47K			
R15	1000Ω				R30	470Ω	2		
R16	88Ω			R31	100Ω	1			

Note 1. Some versions may use 120Ω in this application.

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Stromberg-Carlson PART No.	Halderson PART No.	Merit PART No.	Rom PART No.	Stencor PART No.	Thorderson PART No.	Triod PART No.
T1	117V ④.41A	330VCT ④.055A	0.3V ④3.3A	161457-000						

## COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		Stromberg-Carlson PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.	
L1	FM Ant. Coil	114191-000					VP-9 1.7 Microhenries
L2	Neut. Coil	114189-000	19-1002	BC-563	4608		
L3	RF Choke	114693-000	19-1002	BC-563	4608		
L4	RF Choke	114693-000	19-1002	BC-563	4608		2.2 Microhenries, IRC part #CLA
L5	FM RF Coil	114191-000					.47 Microhenry, IRC part #CLA
L6	Carbide Choke	114729-000		BC-560	4588		
L7	FM Osc. Coil	114190-000					2.2 Microhenries, IRC part #CLA
L8	RF Choke	114693-000	19-1002	BC-563	4608		
L9	Loop Stick	139074-000					RF-1 .47 Microhenry, IRC part #CL-2
L10	AM Ant. Coil	114185-000		BC-549	6302		
L11	AM Osc. Coil	114188-000	14-1055		70-08C		
L12	1st. FM IF	114383-000	18-3487	FM-264	1463		
L13	1st. AM IF	114284-000	16-6758	BC-352	12-C1		
L14	FL. Choke	114707-000		BC-580	4588		
L15	2nd. FM IF	114383-000	18-3487	FM-264	1463		
L16	2nd. AM IF	114453-000	16-8770	BC-356	12-C6		
L17	Ratio Det.	114485-000	17-3498	FM-265	1465		

## MISCELLANEOUS

ITEM No.	PART NAME	Stromberg-Carlson PART No.	NOTES
M1	Dial Lamp		#47
M2	Dial Lamp		#47
M3	Tuning Cap.	110085-000	10µg (AM:Ant. 30-335mmf, Osc. 13-129mmf)
M4	Switch	159064-000	Function (Rotary, wafar type)

## PARTS LIST AND DESCRIPTIONS (Continued)

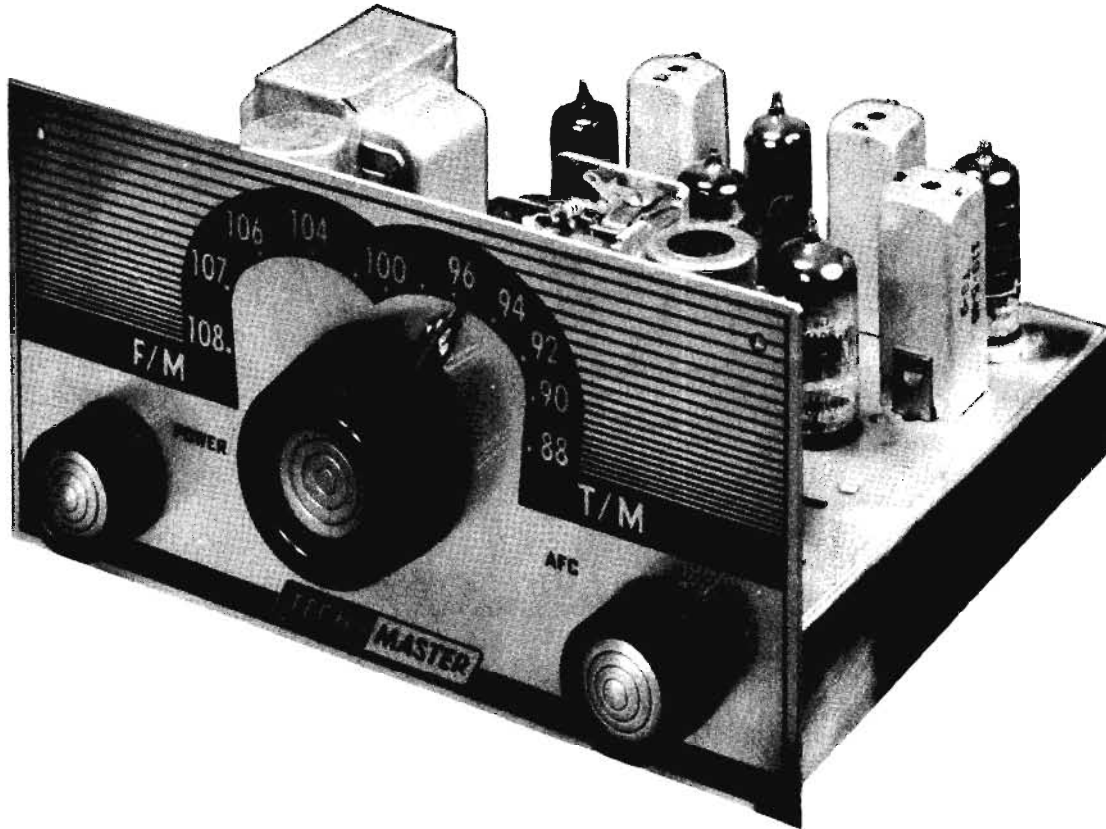
## CABINETS &amp; CABINET PARTS

(When Ordering Cabinets &amp; Cabinet Parts, Specify Model, Chassis &amp; Color)

NAME	PART NO.	DESCRIPTION
Dial Glass	122082-000	
Dial Bezel	125634-000	
Knob	134302-000	Tan, large
Knob	134306-000	Tan, small with dot
Dial Pointer	144603-000	

## WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors  
 8524 (Stranded) Available in Ten Colors  
 Power Cord ..... Use BELDEN No. 1785-B (8 Ft. Length)  
 1725-K (7½ Ft. Length)



TECH-MASTER  
MODEL FM-18

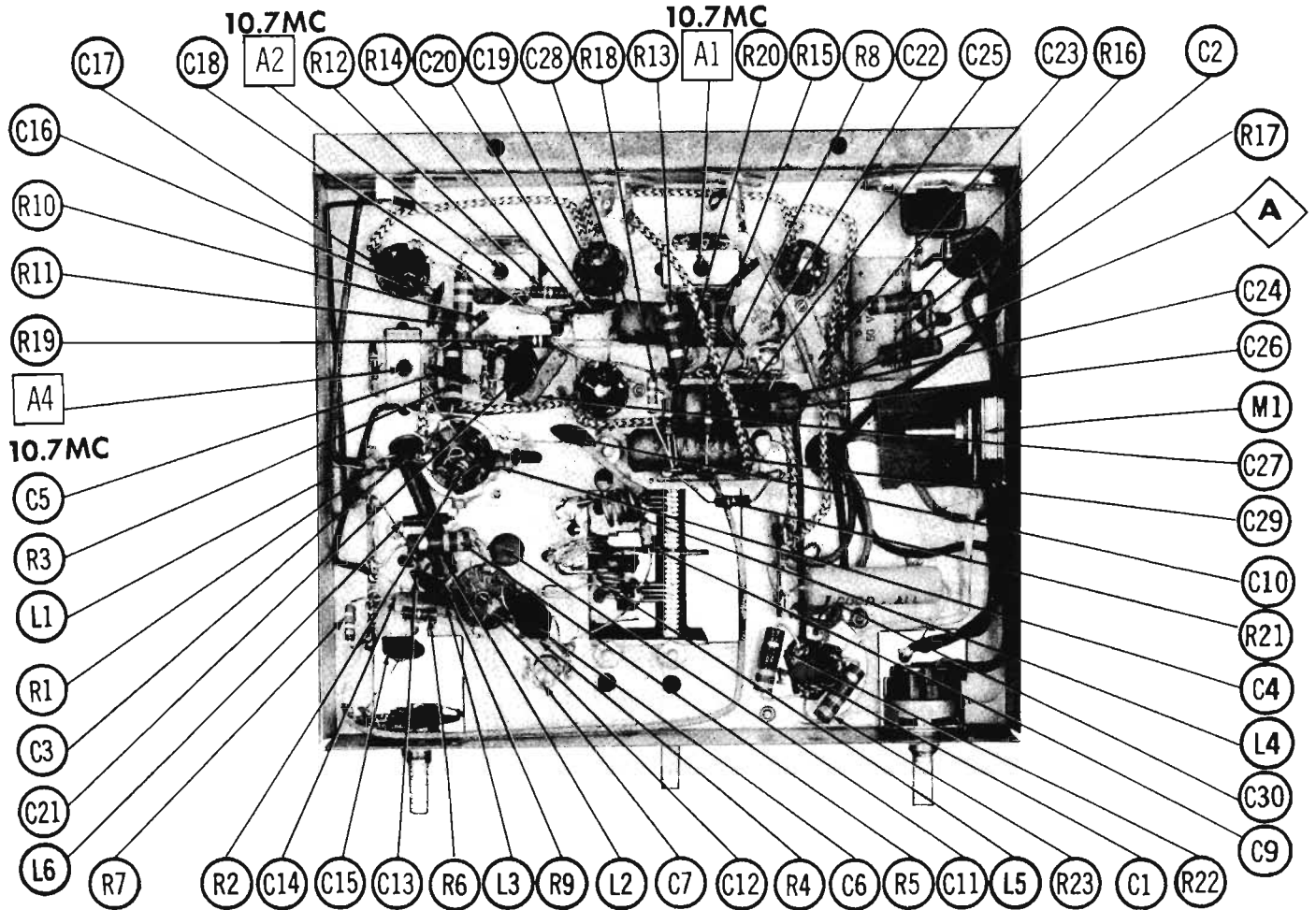
TRADE NAME	Tech-Master Model FM-18	
MANUFACTURER	Tech-Master Corp., 75 Front St., Brooklyn 1, N. Y.	
TYPE SET	AC Operated FM Tuner	
TUBES (Six)	Types 12AT7 RF Amp. -Mixer, 12AT7 Osc. -AFC, 6BA6 1st. IF Amplifier, 6AU6 2nd. IF Amplifier, 6AL5 Ratio Detector, 6C4 AF Amplifier	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .22 Amp. @ 117 Volts AC (21 Watts)
TUNING RANGE - FREQ. MOD.	88-108MC	

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CHASSIS BOTTOM VIEW

## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amp.-Mixer	12AT7	
V2	Osc.-AFC	12AT7	
V3	1st. IF Amp.	8BA6	

ITEM No.	USE	TYPE	NOTES
V4	2nd. IF Amp.	6AU6	
V5	Ratio Detector	6AL5	
V6	AF Amplifier	6C4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Tech.-Master PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLOY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	#40	150	CE119C	AFB3-10	C0090	FP311.5	TMT-9	T-045	TVL-3442
B	440	180							
C	40	180							
C	5	50							
C	5	50							
			①	FRS50V5	BBR5-50	TC30	TD-5-50	MT-0504	TVA-1303

① Some versions may use 4mf (Part #CE112A) in this application.

### FIXED CAPACITORS

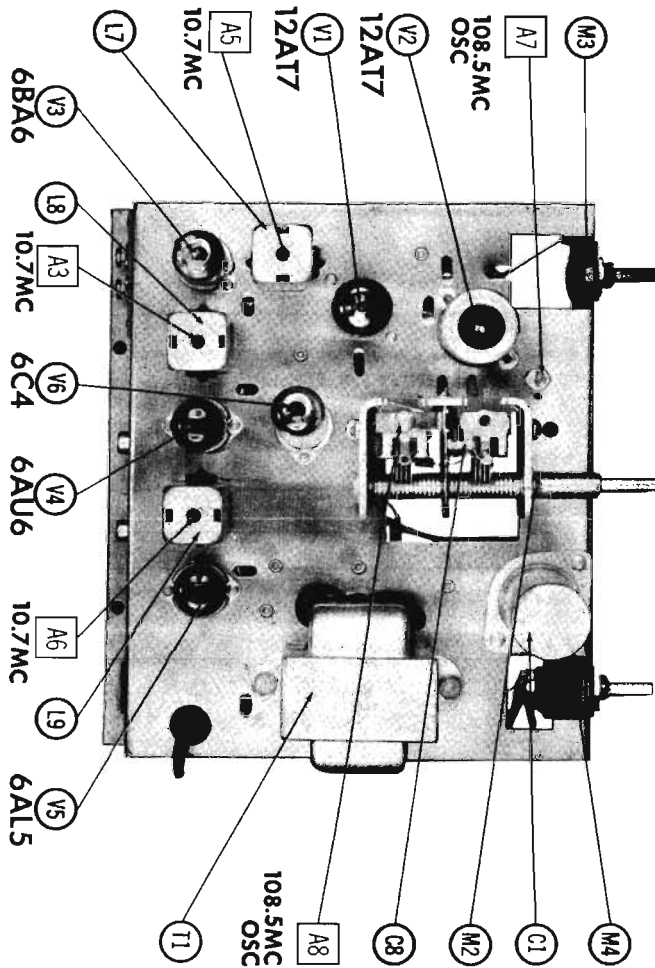
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mico and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA								NOTES
	CAP.	VOLT.	Tech.-Master PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLOY PART No.	SPRAGUE PART No.		
C3	1000		CV13	BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1	N750	
C4	47			BPD-000047	DD-470	LJ0Q47	ED-47	UC-5447	5GA-Q47		
C5	5000			BPD-005	DD-502	BYA10D5	ED-005	DC645	5HK-D5		
C6	100			N750-D1.100	TCN-100	C10T1U	TC7-100	NT-531	5TCU-T1		
C7	1-8					532-B					
C8	10					CTA6Q1U	TC7-10	NT-541	5TCU-Q1		
C9	2, 2			N750-S1.2	TCN-10	C10V22C	TCO-2, 2		5TCCB-V22		
C10	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1		
C11	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1		
C12	5			NPO-S1.5.0	TCZ-4R7	C10V5C	TCO-5	ZT-555	5TCCB-V5		
C13	1000			BPD-001	DD-102	BYA6D1	ED-1000	DC521	5HK-D1		
C14	130				TCN-130	TC7-130					
C15	10000			BPD-01	DD-103	BYA6G1	ED-01	DC511	5HK-S1	N750 5%①	
C16	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5		
C17	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5		
C18	47	2000									
C19	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5	10%	
C20	6000			BPD-005	DD-502	BYA10D5	ED-005	DC625	5HK-D5		
C21	5000			BPD-005	DD-502	BYA10D5	ED-005	DC525	5HK-D5		
C22	130				TCN-130	TC7-130					
C23	130				TCN-130	TC7-130					
C24	470			BPD-00047	DD-470	BYA10T47	ED-470	UC-5347	5GA-T47	N750 5%① N750 5%②	
C25	1500			81 1500	D6-152	L78D15	GP-1500	UC-5215	5GA-D15		
C26	.05	200		P288N-05	DF-503	CUB285		GEM-415	5TM-85		
C27	220			1488-00022	D6-221	5W6T22	ED-220		5FM-322		
C28	.05	200		P288N-05	DF-503	CUB285		GEM-415	5TM-85		
C29	.05	200		P288N-05	DF-503	CUB285		GEM-415	5TM-85		
C30	.047	400		P288N-047	DF-503	CUB2847		GEM-4147	5TM-347		

① Some versions may use 120mmf in this application.

② Not used in some versions.

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Tech-Master PART No.	NOTES	ITEM No.	RATING		Tech-Master PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R1	68Ω				R13	470Ω	1		
R2	3.3meg	1/2			R14	100Ω			
R3	470Ω	1			R15	39K			
R4	12K				R16	8200Ω	1		
R5	470Ω	1			R17	8200Ω	1		
R6	100Ω				R18	470K			
R7	470K				R19	100K			
R8	1meg				R20	1000Ω			
R9	560Ω				R21	22K			
R10	1meg				R22	330Ω	1		
R11	470Ω	1			R23	330Ω	1		
R12	22K								

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Tech-Master PART No.	Halldorson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thorndorson PART No.	Triod PART No.
	T1	117V ①. 21A	120V ①. 042A	6.3V ①. 1.6A	TP18	P9101 ①	P-3045 ①		PA8421 ①	22R12 ①

① Drill new mounting hole.

### COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		Tech-Master PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Rom PART No.	
L1	Ant. Coil	L108					.34 Microhenry 1 Microhenry 2 Microhenries
L2	Fl. Choke	L204-1	19-1000	BC-561	4588		
L3	RF Choke	L108			4602		
L4	Mixer Coil	L109					
L5	Osc. Coil	L110					
L6	RF Choke	L108					2 Microhenries
L7	Input IF	T8-9	16-3487	FM-254	1463		
L8	Output IF	T7-8	16-3487	FM-254	1463		
L9	Output IF	C1448	16-3487	FM-254	1463		Alternate
	Ratio Det.	C1542-2	17-3498	FM-255	1465		Alternate
	Ratio Det.	C1542	17-3498	FM-255	1465		Alternate
	Ratio Det.	T7-3	17-3498	FM-255	1465		Alternate

## PARTS LIST AND DESCRIPTIONS (Continued)

### RECTIFIERS

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	CURRENT (Measured)	Tech-Master PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKIS TAZSIAN PART No.		
M1	.041A	SR65 ①	1002A ①	R6085 ①	85 ① M150 ②	① Selenium Type ② Silicon Type	

### MISCELLANEOUS

ITEM No.	PART NAME	Tech-Master PART No.	NOTES
M2	Tuning Cap.	CV11	2 Gang
M3	Switch	8W112	AFC (Rotary, wafer type)
M4	Switch	8W111	Power On-off (SPST)

### CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob Dial Pointer	KN KN15-1	On-off-AFC, Tuning

### WIRING DATA

General-use Unshielded Hook-up Wire.....	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord .....	Use BELDEN No. 1785-B (8 Ft. Length) 1785-K (7½ Ft. Length)

# ALIGNMENT INSTRUCTIONS

## PRE-ALIGNMENT INSTRUCTIONS

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

## IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1. .005mfd	High side to RF stator lug of tuning gang. Low side to chassis.	10.7MC (Unmod)	Tuning gang fully closed	DC probe to point $\text{A}$ . Common to chassis.	A1, A2, A3, A4, A5	Adjust for maximum deflection.
2. "	"	"	"	DC probe to point $\text{B}$ . Common to chassis.	A6	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Repeat steps 1 and 2.

## IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 80% modulation and 450KC sweep. Use 120v sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1. .005mfd	High side to RF stator lug of tuning gang. Low side to chassis.	10.7MC (450KC Swp)	Tuning gang fully closed.	Vert. Amp. to point $\text{A}$ . Low side to chassis.	A1, A2, A3, A4, A5	Disconnect stabilizing capacitor (C2). Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
2. "	"	"	"	Vert. Amp. to point $\text{B}$ . Low side to chassis.	A6	Reconnect C2. Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A1 for maximum amplitude and straightness of crossover lines.

## FM RF ALIGNMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
3. .005mfd	Across FM antenna terminals.	87.5MC (Unmod)	Tuning gang fully closed.	DC probe to point $\text{A}$ . Common to chassis.	L5	Preset A7 to mid-point of its range, and A8 to MINIMUM capacity. Adjust L5 for maximum deflection by compressing or expanding coil turns.
4. "	"	108.5MC	Tuning gang fully open.	"	A7	Adjust for maximum deflection.
5. "	"	87.5MC	Tuning gang fully closed.	"	L4	Adjust for maximum deflection by compressing or expanding coil turns.
6. "	"	108.5MC	Tuning gang fully open.	"	A8	Adjust for maximum deflection.

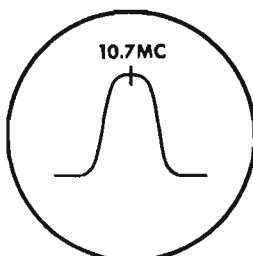


FIG. 1

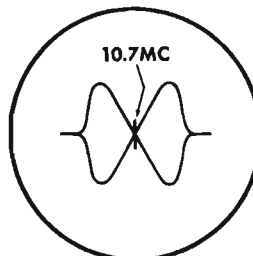
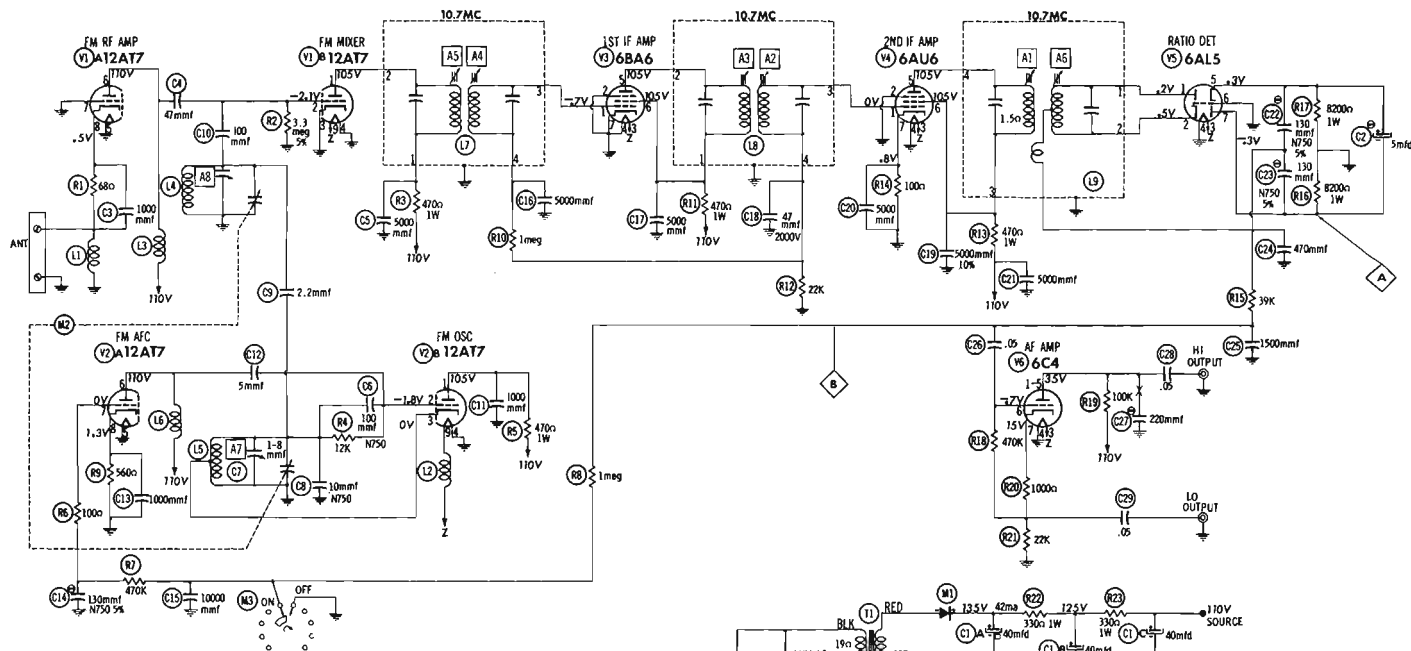


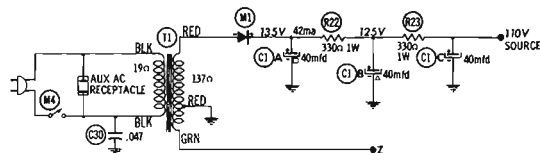
FIG. 2



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12A12A7	11100 $\Omega$	3.3meg	0 $\Omega$	0 $\Omega$	0 $\Omega$	1660 $\Omega$	0 $\Omega$	68 $\Omega$	.1 $\Omega$
V2	12A12A7	11100 $\Omega$	12K	0 $\Omega$	0 $\Omega$	0 $\Omega$	1660 $\Omega$	1N	560 $\Omega$	.1 $\Omega$
V3	6BA6	1meg	0 $\Omega$	.1 $\Omega$	0 $\Omega$	11100 $\Omega$	11100 $\Omega$	0 $\Omega$		
V4	6AU6	22K	0 $\Omega$	.1 $\Omega$	0 $\Omega$	11100 $\Omega$	11100 $\Omega$	100 $\Omega$		
V5	6AL5	1N	1N	.1 $\Omega$	0 $\Omega$	8200 $\Omega$	0 $\Omega$	8200 $\Omega$		
V6	6C4	1100K	NC	.1 $\Omega$	0 $\Omega$	1100K	490K	23K		

† MEASURED FROM OUTPUT OF M1.  
 \* MEASURED FROM PIN 7 OF V6.  
 NC NO CONNECTION.



- DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 100 $\Omega$  ohms per volt.
- Socket connections are shown as bottom views.
- Measured values are from socket pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance on component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
- Volume control at maximum; no signal applied for voltage measurements.

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

**SERVICING**

**hi-fi**

**AM-FM  
TUNERS**

**SERVICING HI-FI  
AM-FM TUNERS**

Contains complete information on the operation, circuitry, maintenance, replacement parts, and adjustments for 1957-58 AM-FM Tuners. Data on the following brand names appears in this volume:

BELL SOUND	GROMMES
CRAFTSMEN	HARMON-KARDON
DAVID BOGEN	KNIGHT
DEWALD	SCOTT (H. H.)
ELECTRO-VOICE	SHERWOOD
FISHER	STROMBERG-CARLSON
	TECH-MASTER

A



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