

# SERVICING

# hi-fi

## PREAMPS AND AMPLIFIERS

**Includes Two Sections . . .**

**SECTION I—SERVICE FACTS ABOUT  
PREAMPS AND AMPLIFIERS**

- Analyzing Equalization Networks
- Using the Audio Signal Generator to Test Amplifier Response
- A Glimpse into Stereo Preampl Design
- Interesting Facts About Feedback in Amplifiers

**SECTION II—COMPLETE PHOTOFAC  
SERVICE DATA**

on 33 models of 1957-58  
Preamps and Amplifiers

- PHOTOFAC Schematics
- Resistance Charts
- Cabinet and Chassis Photographs
- Parts Lists and Replacement Data

A *Hans W. Baum*

PHOTOFAC PUBLICATION—HF-4



# SERVICING HI-FI PREAMPS AND AMPLIFIERS

VOLUME 4  
(HF-4)



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# SERVICE FACTS ABOUT PREAMPS AND AMPLIFIERS

## ANALYZING EQUALIZATION NETWORKS

In a hi-fi system, it is generally desirable to have a flat frequency response over the entire audible range. This doesn't mean that every component (speaker, amplifiers, cartridge, etc.) will have a flat response, nor does it mean that corrective measures will be taken with every unit to produce this desired response. It does mean, however, that action should be taken to insure that the output will be as nearly like the original music or sound as possible.

What do we mean by flat? Simply stated, a flat response is realized when, after the volume control is adjusted to reproduce the original volume level at any one frequency, this same volume level will be reproduced at all frequencies on the recording. Now that we have established the need for a frequency response that is flat and covers the entire audible range, let's see how equalization and equalizers fit into the picture.

Those of you who are familiar with the specifications for playback power amplifiers know that a typical listing of these specs might be 30 watts of audio over the range of 20 cps to 50 kc  $\pm 1.5$  db at less than 3% IM (intermodulation) distortion. You should also be familiar with the fact that a speaker enclosure is designed to load the speaker and, thus, match it to the output amplifier to produce an essentially flat frequency response. It is also readily accepted that voltage amplifier stages can be designed with a flat frequency response over the entire audio range. Why, then, is equalization (frequency compensation) needed?

There are two main reasons — the pickup device used in the playback system, and the recording itself. Let's examine the recording first. Most pickup cartridges utilize the velocity principle, where the output signal voltage is proportional to the excursion rate of the needle. It just so happens that when the record is cut to produce equal velocities for all frequencies of the same voltage amplitude, the excursion distance is inversely proportional to the frequency.

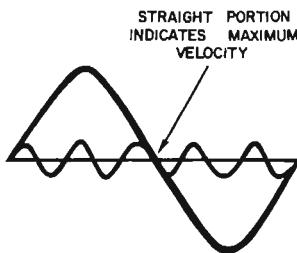


Fig. 1. A constant velocity at all frequencies results in higher amplitudes at low frequencies.

In Fig. 1, two signals are superimposed to illustrate this phenomenon. This would mean (using practical figures) that if an excursion of 1/10,000 of an inch produced maximum output voltage at 20,000 cps, then the excursion required to produce the same output at 20 cps would be 1/10 of an inch. Naturally, grooves 1/10 of an inch wide cannot possibly be packed 100 to the inch on a record. Some LP and extended play 45's even have more than 100 grooves to the inch. For this reason then, the amplitudes of low-frequency sig-

nals are attenuated before they are applied to the record.

On modern recordings, this attenuation is not done on a helter-skelter basis. Instead, most recordings are now based on the RIAA (Recording Industry Association of America) curve shown in Fig. 2.

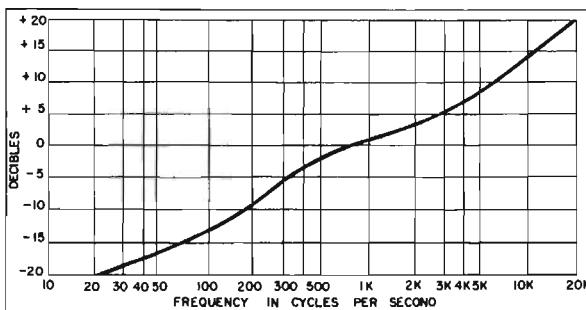


Fig. 2. RIAA recording curve ( $\pm 2$  db tolerance).

As you can readily see, all signals with a frequency below 1,000 cps will be attenuated, while those above 1,000 cps will be boosted. Applying this information to your knowledge of a playback system, you can see that if we are to hear music as it sounded before being put on the record, some frequency compensation must be employed in the playback system. The RIAA playback curve in Fig. 3 is the reverse of the record curve in Fig. 2, and equalization in the playback must boost the low frequencies and attenuate the high frequencies in accordance with this curve to produce a flat response.

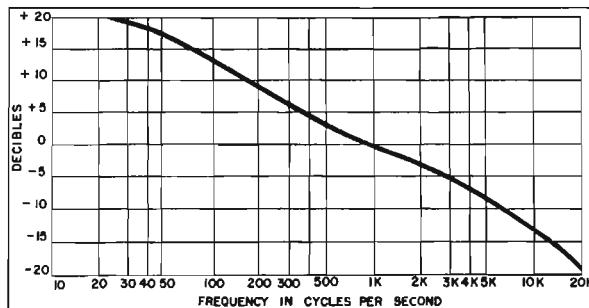


Fig. 3. RIAA playback curve ( $\pm 2$  db tolerance).

This, of course, assumes a flat response characteristic for the pickup device — a condition not always found. To compensate for the frequency-characteristic differences between the various pickup devices, tone controls that can either boost or attenuate both low and high frequencies are included in playback systems, but the ranges of these controls are generally not sufficient to complement the record curve. Thus, a special circuit that accomplishes the required equalization is incorporated in the playback amplifier and is almost always made up of combinations of resistors and capacitors. Let's examine the basic circuit in Fig. 4 and see how this combination of resistance and capacitance can be used for frequency correction.

First of all, let's eliminate the components not primarily tied in with frequency correction — the plate-load resistor R1 for the first stage, the coupling capacitor and DC blocker C1, and the DC return R4 for the grid of the second stage. Actually, C1 does affect the low-frequency response since its impedance will be fairly high at low audio frequencies, but this is not the reason it is used. As a matter of fact, its effect is the opposite of what we are trying to obtain and must be considered in the design of the compensating network.

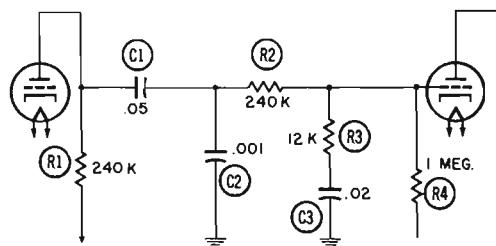


Fig. 4. Basic equalization circuit.

Getting into the network itself, we find that C2 and R2 form a low-pass filter network which attenuates the highs more than the lows. This happens because the higher the frequency, the lower the value of  $X_C$  for any given capacitor. In the vernacular of the hi-fi fan, C2 provides high frequency roll-off.

Now we get to the series network of R3 and C3, and again we have a reactance ( $X_C$ ) that varies with frequency. If you calculate the reactance of a .02-mfd capacitor, you will find that: at 60 cps,  $X_C$  equals 191K, at 1,000 cps,  $X_C$  equals 7,950 ohms; at 10,000 cps,  $X_C$  equals 795 ohms; and at 20,000 cps,  $X_C$  equals 397 ohms. Since  $X_C$  and R are in series, the net result is an impedance which varies from 12,397 ohms at 20 kc to 203,000 ohms at 60 cps.

If we further analyze this circuit, we see that any signal at the junction of C1, C2 and R2 will divide between R2 and the combination of R3 and C3. Since the total impedance of R3 and C3 is higher at low frequencies, more signal voltage will be applied to the output grid at low frequencies. This is the type of equalization circuitry employed for a common variable-reluctance style of pickup cartridge.

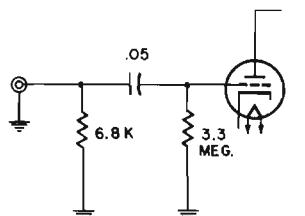


Fig. 5. Equalization in input circuit.

Equalization may not always be accomplished entirely between the halves of a dual triode, as shown in Fig. 4. In many cases, high frequency roll-off is accomplished through the use of a small resistor across the input, as shown in Fig. 5. Its purpose is to provide damping for the variable-reluctance cartridge and, thus, reduce the highs.

Other types of pickup devices usually require different equalization characteristics; furthermore, different circuit designs (such as pentode-to-triode or triode-to-pentode) will require different equalization network configurations. However, these circuits could also be analyzed for an understanding of how they are used to accomplish equalization.

## USING THE AUDIO SIGNAL GENERATOR TO TEST AMPLIFIER RESPONSE

Testing a high-quality amplifier without specialized equipment has always been a problem. However, an amplifier can be checked for power output and frequency response with an audio signal generator, AC voltmeter, and scope. If the scope has a wide bandpass response, flat from 0 to 1,000,000 cps or greater, a square-wave audio signal can be used to check both high- and low-frequency responses of the amplifier. If, however, the scope is the general-service type (response to 500 kc), then a sine-wave signal is more suitable. The limited response of a narrow-band scope will distort the square wave slightly and affect the accuracy of the test.

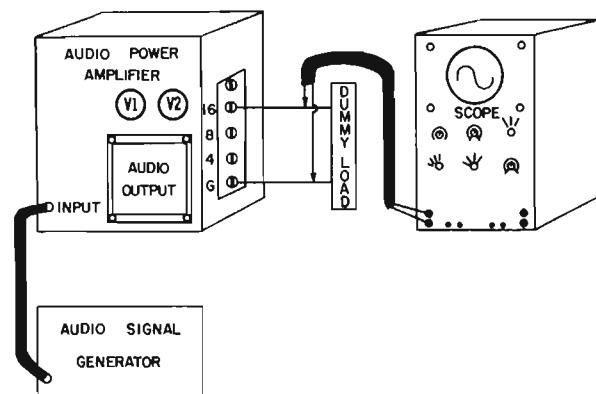
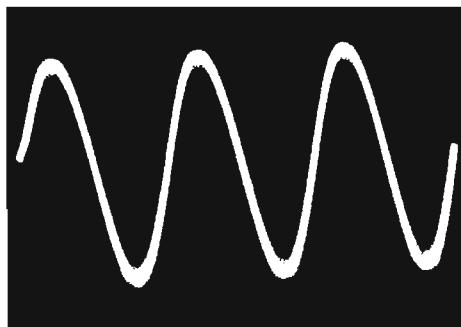
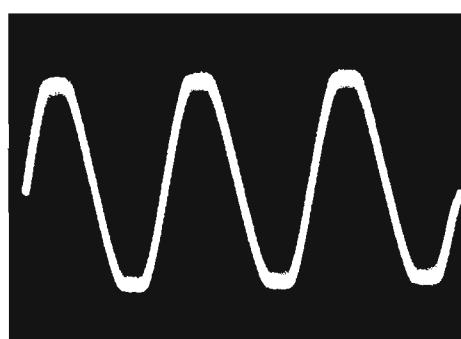


Fig. 6. Test setup for checking amplifier gain over the audio-frequency range.



(A) No clipping.



(B) Mild clipping.

Fig. 7. Comparison of scope patterns observed when setting generator gain level.

In making the test setup, the audio sine-wave signal is applied to the amplifier input, and the speaker output terminals are terminated with a suitable resistor (8 or 16 ohms of a wattage equal to or greater than the power rating of the amplifier). The scope is connected across this resistor, as shown in Fig. 6. A 25-ohm, 100-watt potentiometer makes a good universal dummy load.

After allowing about 15 minutes for warmup, set the signal generator frequency at 1,000 cps and adjust the signal level to the point just below clipping, as illustrated in Fig. 7. The AC output voltage can now be measured across the dummy resistor. A sensitive AC VTVM is best for this measurement; however, a conventional 5,000 ohm-per-volt VOM will give satisfactory performance. Compare your readings with those in Table I to obtain the power output capability of the amplifier under test. If you use a conventional VOM, your amplifier is producing a power output equal to or slightly higher (10 to 15%) than the figure in the table.

DUMMY LOAD— 4 OHMS		DUMMY LOAD— 8 OHMS		DUMMY LOAD— 16 OHMS	
VOLTAGE	WATTS	VOLTAGE	WATTS	VOLTAGE	WATTS
2	1	4	2.0	8	4
2.3	1.3	5	3.125	9	5
2.6	1.71	6	4.5	10	6.25
3	2.25	7	6.125	11	7.5
3.5	3	8	8	12	8
4	4	9	10.1	13	10.6
5	6.25	10	12.5	14	12.25
6	9	11	15	15	14
7	12.5	12	18	16	16
8	16	13	21	17	18
		14	24.5	18	20
		15	28	19	22.5
		16	32	20	25
				21	27.5
				22	30
				23	33
				24	36
				25	39
				30	56
				35	75.6
				40	100

Table I. Power Output in Terms of Voltage Across Fixed Resistor.

To check frequency response, adjust the signal-generator frequency to the lowest frequency the amplifier can pass, and adjust the generator output to produce a signal level above which clipping will take place. Repeat this operation at 500- to 1,000-cps increments across the audio spectrum, noting the voltage reading obtained. Plotting the readings on a graph, as

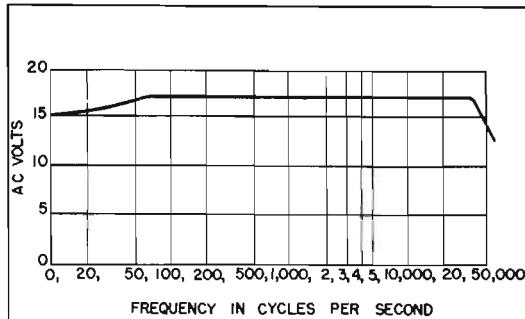


Fig. 8. Amplifier response graph obtained by plotting output voltage readings.

shown in Fig. 8, will provide a gain curve of the amplifier. Harmonic or intermodulation distortion will not be evident; but if the gain curve is fairly flat across the band (similar to Fig. 8), the amplifier is doing a reasonably good job. If you need a more accurate check, use a harmonic distortion analyzer and intermodulation analyzer in the prescribed manner.

#### A GLIMPSE INTO STEREO PREAMP DESIGN

To say a preamp is a preamp and a stereo preamp is simply two preamps would be like saying any two babies are twins. Since we know a 6SN7 won't work as the final amplifier in a 100-kw transmitter stage, we can realize that a stereo preamp isn't just two of everything. While two of everything is required, several other considerations are of utmost importance to stereo operation. In the block diagram of Fig. 9,

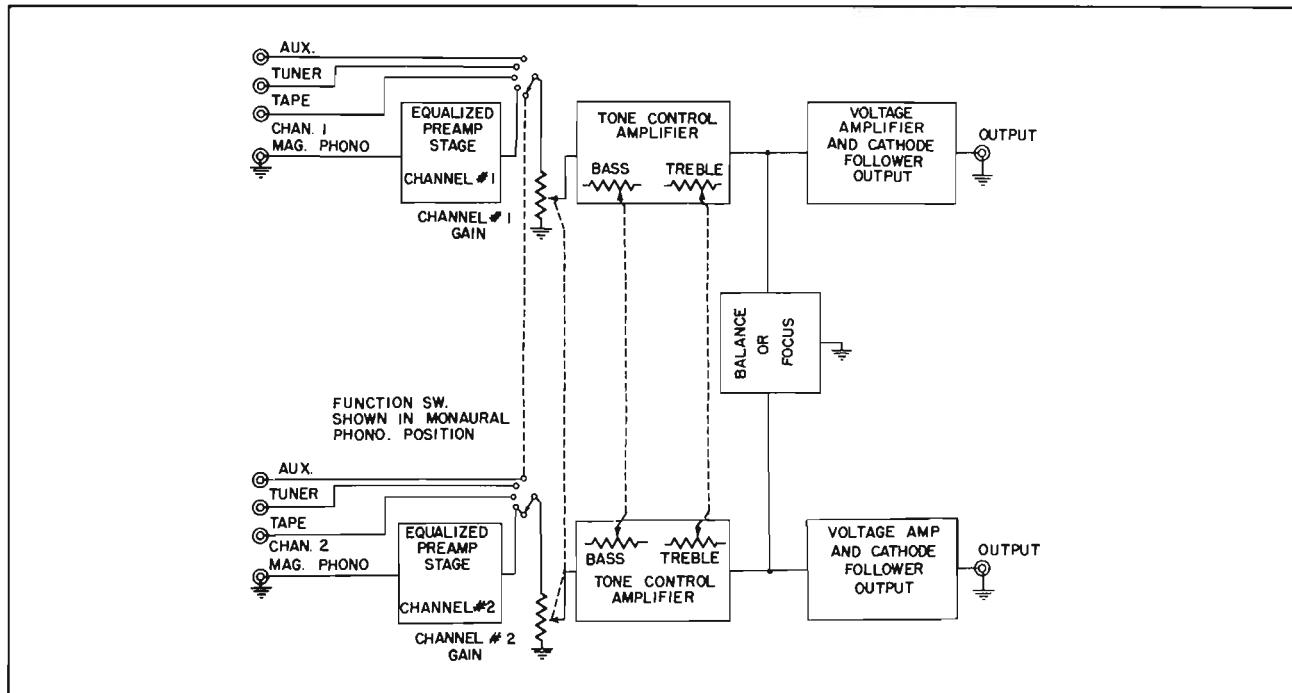


Fig. 9. Block diagram of basic stereo preamplifier, showing pair of identical sound channels, ganged controls, balance network, and function-switch circuit.

for example, you will notice such things as balance control, ganged controls, monaural phono position, and two input jacks for each position on the function selector (except monaural phono). Ganged equalization switches that simultaneously provide the desired equalization to both preamplifier stages may also be provided.

Of particular interest is the fact that the function selector switches, gain, treble, and bass controls of the two channels are ganged — making this portion of the stereo preamplifier no more complicated to operate than a single-channel preamplifier.

The gain controls in Fig. 9 might be labeled volume or loudness in a commercial unit. The function would be the same, however — to vary the output signal of the two channels equally and simultaneously. The ganged bass and treble controls need no explanation other than that they provide simultaneous changes in bass or treble response for the two channels. The design of the circuit in each channel must consider this ganged operation, and the components selected must be of close tolerance to insure a balanced operating condition.

The balance or focus control is peculiar to stereo preamps — monaural units don't have one. This control provides precise balancing of the two output signal amplitudes. If, for any reason (such as unbalanced gain in the preceding stages), the output signals are not identical in amplitude, the balance control can be adjusted to achieve the desired degree of equality. While the balance control is shown connecting the two channels, it does so only from a DC bias standpoint. It does not link the signals in the two channels, nor does it in any way cause the two signals to be mixed.

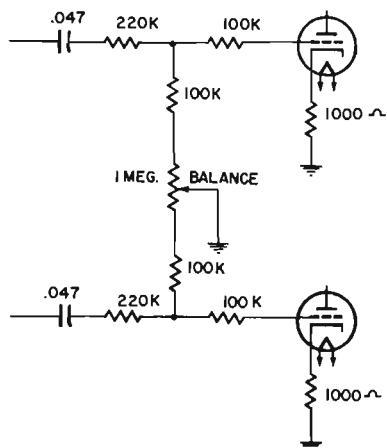


Fig. 10. Schematic of balance control network between stereo preamp channels.

The sample circuit in Fig. 10 shows how the balance control connects into the circuit to do its required job. As you can see, the control is in the common grid return and varies the ratio of DC resistance in each grid circuit. Because of this feature, a stage of gain is provided after the balance control and just ahead of the usual cathode-follower output stage. Thus, where some commercial preamp designs have employed only two dual-triode tubes (one tube as equalized preamp, one-half tube as tone-control amplifier, and one-half tube as a cathode follower), many stereo preamps will employ three dual triodes in each channel. When this is done, one tube will probably be used

for equalized preamp stages, one as a tone-control amplifier, and one as a voltage amplifier and cathode-follower output.

The major problem in stereo preamp design is to construct the unit so that it will provide identical performance on both channels without interaction between the two. This is achieved by the use of close-tolerance components, matched tubes, adequate filtering and decoupling between the two channels and the power supply, and careful layout of components so that ground loops will not be created. While the foregoing are most important on the manufacturing level, they also enter the picture whenever service is required. The service technician should replace defective components with replacements having identical ratings and characteristics. Furthermore, replacements should be installed exactly like the originals; ground connections, etc., should not be moved, even though it may be easier to connect a part differently. Also, any tube to be used in a stereo preamp should be aged in the circuit for 24 hours before the unit undergoes a final check prior to its return.

### INTERESTING FACTS ABOUT FEEDBACK IN AMPLIFIERS

Feedback is a term often encountered by anyone active in audio work, especially by those who have a particular interest in amplifiers. Persons who work with public-address systems may connect the term with the howls and squeals that occur when sound from a loudspeaker is picked up by the microphone which picked up the original signal. The service technician, on the other hand, may be reminded of the whistles and squeals heard from a radio loudspeaker because unwanted feedback or coupling in some part of the receiver circuit caused the circuit to oscillate.

Feedback occurs when a portion of a signal in one part of an amplifier is reintroduced, or fed back, to a circuit nearer the amplifier input. The feedback is positive when the signal fed back is in phase with the input signal, in which case the gain of the circuit will increase and cause oscillation. The feedback is negative when the signal fed back is out of phase with the input signal. In this case, the gain of the circuit will be reduced.

We will concern ourselves here with the negative (or inverse) feedback applied to amplifiers to obtain certain desirable results. Almost everyone who works with amplifiers is acquainted with the basic principle of how an out-of-phase signal is fed back into an amplifier to reduce distortion, but this is only part of the story and is far from being enough to be of much assistance when an amplifier is being tested or serviced. The service technician should be familiar with the principles involved in negative feedback because some unusual and puzzling conditions can arise when a circuit included in a feedback loop is modified or disturbed. The term "feedback loop" refers to the circuit between the point where the feedback signal is taken from the circuit and the point where it is fed back into the circuit.

Negative feedback is largely responsible for the very low percentages of distortion featured by modern high-quality amplifiers. Only a few years ago, an amplifier with five per cent harmonic distortion was considered very good, but now the situation has changed. With the use of negative feedback, improved circuits, and high-grade output transformers in

present-day amplifiers, one-half per cent harmonic distortion at rated output is common, and much lower percentages are not at all unusual.

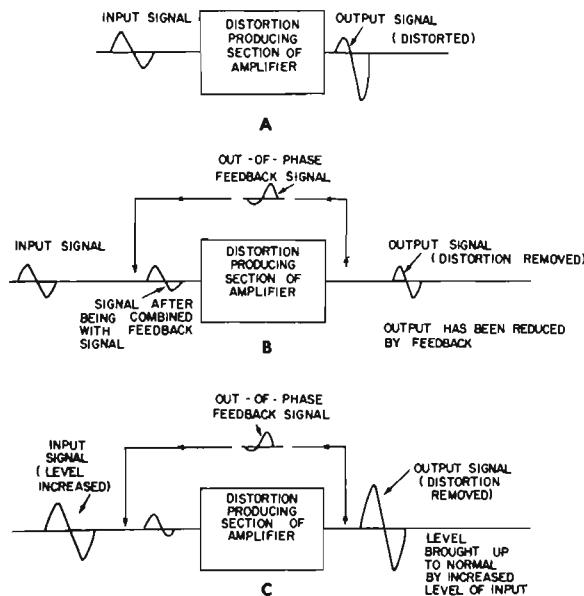


Fig. 11. The effect of negative feedback on a distorted signal.

The basic effect of negative feedback is illustrated in Fig. 11. The undistorted input signal and the distorted output signal are shown in Fig. 11A. The distortion of the output signal is evident because one peak of the signal waveform reaches a greater amplitude than the other. Such distortion, due to the nonlinear operation of tubes and other circuit components, is characteristic of amplifiers. A portion of the distorted output signal is fed back out of phase to the input, where it combines with and modifies the input signal, as shown in Fig. 11B. The input signal is actually distorted by the out-of-phase feedback signal, so that the greater part of the distortion developed in the amplifying circuit is counteracted. Note that in Fig. 11B, the amplitude of the output signal has been reduced because of negative feedback. The output can be brought up to its normal level, as in Fig. 11C, if the

level of the input signal is increased. The power-handling capabilities of amplifiers are not reduced by the application of negative feedback.

To be effective, the out-of-phase feedback signal must be taken from the amplifier at a point following the circuit in which the distortion is developed and must be fed into the amplifier at a point ahead of the circuit in which the distortion is developed.

The amount of negative feedback in an amplifier is rated in decibels and is the ratio of the output voltage obtained without feedback to the output voltage developed when feedback is applied. In other words, it is the gain reduction, in decibels, caused by the application of negative feedback.

The amount of negative feedback that can be used is limited, for several reasons. In the first place, we can realize that the full signal could not be fed back because the output would then drop to zero. This is never approached in actual practice because more than 20 decibels of feedback are seldom applied in a single feedback loop.

If 20 decibels of feedback were used in such a manner as to be fully effective, distortion and noise in the circuit would be reduced by a factor of 10. The gain of the circuit would also be reduced by a factor of 10; therefore, 10 times the amount of signal required before the feedback was applied would have to be used to obtain the same power output. For example, if 0.1 volt of input signal were required for a 20-watt output from an amplifier without feedback, then 1.0 volt of input signal would be needed to obtain the normal output of 20 watts after 20 decibels of feedback were applied.

An amplifier must be carefully designed and must use high-quality components if any large amount of negative feedback is to be utilized satisfactorily. Otherwise, the operation of the amplifier can become very unstable, even when only a moderate amount of feedback is applied.

Negative feedback is not a cure-all and must not be relied upon to make an excellent amplifier out of one that was poorly designed with undesirable characteristics. Negative feedback can make a very noticeable improvement in the operation of a mediocre amplifier, but it cannot work miracles.

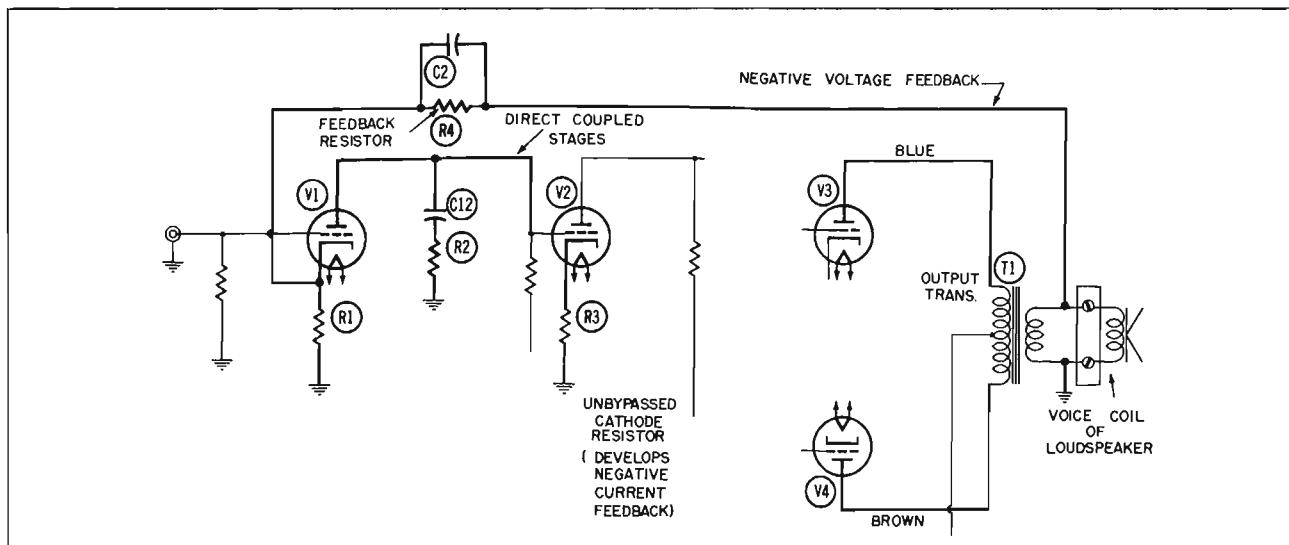


Fig. 12. Partial schematic diagram of a typical amplifier circuit using negative feedback.

Fig. 12 shows a partial schematic of a typical amplifier circuit in which the output transformer is included in the negative-feedback loop. A portion of the signal voltage developed across the load (the voice coil of the loudspeaker) is fed back to the cathode of tube V1 in the input stage. The amount of signal fed back depends upon the resistance value of feedback resistor R4. A large value of resistance reduces the amount of feedback, while a low value increases the feedback.

The feedback signal must be  $180^\circ$  out of phase with the input signal to produce the desired effects on the output signal. While the  $180^\circ$  out-of-phase relationship can be maintained readily at midfrequencies, the extreme low and high ends of the frequency range present some difficulties.

Circuit components, particularly the output transformer and the coupling capacitors, tend to shift the signal phase at the extreme high and low frequencies. The phase can be shifted so far that the feedback becomes positive at high and low frequencies. This situation can cause the amplifier to become very unstable at the frequency extremes because positive feedback produces oscillations. The feedback may become positive only on signal peaks, and therefore, the oscillations may occur in bursts and at certain frequencies only. This condition can give rise to many peculiar and disturbing forms of distortion. Loudspeakers have been blamed for a rattling or buzzing sound, when the amplifier was actually at fault.

Various precautions are taken to prevent or at least reduce the phase shift and thereby stabilize the operation of the amplifier. Output transformers with sufficiently low leakage reactances are a necessity. Very large coupling capacitors are employed where required, or capacitors are eliminated altogether by direct coupling. Phase- and frequency-correction networks, such as resistor R2 and capacitor C1 in the plate circuit of V1 or capacitor C2 across feedback resistor R4, aid in stabilizing the amplifier.

Since the feedback signal must be  $180^\circ$  out of phase, the output transformer must be correctly phased in the circuit. For instance, if the plate leads of the transformer were reversed so that the blue lead went to the plate of V4 and the brown lead went to the plate of V3, the phase of the feedback signal would be reversed and would become positive. The amplifier would oscillate and produce a terrific roar or howl.

The feedback in the circuit we have been discussing is voltage feedback because the feedback signal is a portion of the signal voltage developed across the voice coil of the loudspeaker. The results from the use of negative feedback in this circuit are typical of the desirable effects of voltage feedback when it is applied properly. We can list them as follows:

Distortion is reduced.

Certain types of hum and noise are reduced.

Output impedance is decreased.

Loudspeaker damping is increased.

The effects of the varying load presented to the amplifier by the loudspeaker are decreased.

Frequency response is increased.

Tone controls should not be located inside a feedback loop because much of their effectiveness will

be nullified by negative feedback. This is one reason tone controls and other compensating circuits are usually located in another section of the audio system.

An unbypassed cathode resistor is another method of obtaining negative feedback. As an example, R3 in Fig. 2 produces current feedback. Some of the effects of current feedback are the same as those obtained with voltage feedback, while others are the opposite. Some of the characteristic effects of current feedback are:

Distortion is reduced.

Gain is reduced.

Plate resistance of the stage in which the feedback is located is increased.

Effect of load impedance on the output voltage is increased.

Loudspeaker damping is decreased when current feedback is applied.

The damping applied to the loudspeaker can be controlled by varying the amount of feedback. The damping control circuit in Fig. 13 is a good example of this application of negative feedback. Two negative-feedback loops are used. One is voltage feedback, and the other is current feedback. The damping factor can be changed by varying the ratio of voltage feedback to current feedback.

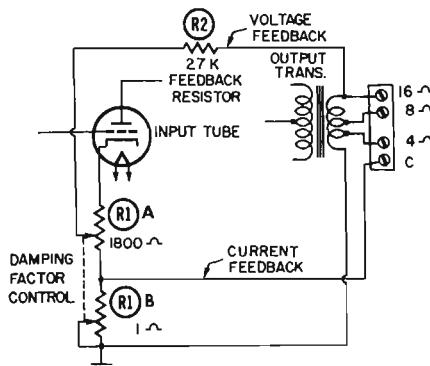


Fig. 13. Circuit using damping factor control.

Negative feedback is developed by the voltage-feedback loop connected from the top (or 16-ohm tap) of the output transformer through feedback resistor R2 to the moving contact of R1A in the cathode circuit of the input tube. When the moving contact is moved to the top or cathode end of R1A, negative voltage feedback will increase to maximum, and maximum damping action will be produced.

Negative feedback is developed in the current feedback circuit connected from the common (C) tap through R1B to ground. When the moving contact of R1B is moved toward the top or cathode end, current feedback will decrease because the resistance is reduced toward zero as R1B is progressively shorted to ground.

When R1B is moved in the opposite direction, current feedback is increased. Here we should recall that loudspeaker damping decreases as negative current feedback increases and that the damping increases when negative voltage feedback increases.

R1A and R1B are ganged and must turn together; therefore, when the damping-factor control tap is

moved to maximum (upward on the schematic), the negative voltage feedback produces the desired maximum damping factor, and no current feedback is produced because R1B is shorted.

When the damping control is set to the minimum position, minimum negative voltage feedback is developed, and the damping factor is reduced. But, in this minimum position, maximum negative current feedback is produced; and this, in turn, also reduces the damping factor. Thus, a large range of damping can be obtained; however, since negative feedback is always applied, distortion will be held to a minimum at any setting of the damping-factor control.

Negative feedback can be utilized by tone controls, compensation circuits for magnetic cartridges, and record-playback compensation circuits in phono preamplifiers to modify the frequency response of an amplifier. This action is possible because the negative-feedback loop can be frequency selective. The feedback network is so modified that certain frequencies are fed back while other frequencies are not. The frequencies that are fed back are attenuated because negative feedback reduces gain, but those that are not fed back are not attenuated and are effectively boosted.

Fig. 14 shows a typical phono-preamplifier circuit in which compensation (bass boost) is obtained with a frequency-selective feedback circuit. C1 (shunted across feedback resistor R1) and C2 (shunted by R2) offer very little opposition to the feedback of high frequencies; consequently, these frequencies are fed back and attenuated. The reactances of C1 and C2 become progressively greater as frequency is lowered, and therefore, the low frequencies are not subjected to as much loss and are effectively boosted. The

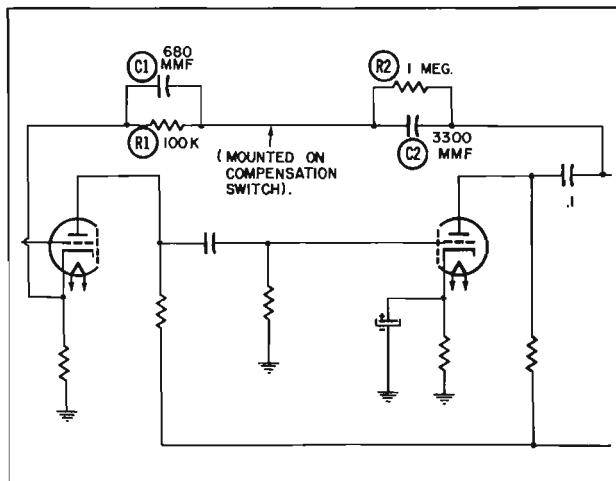
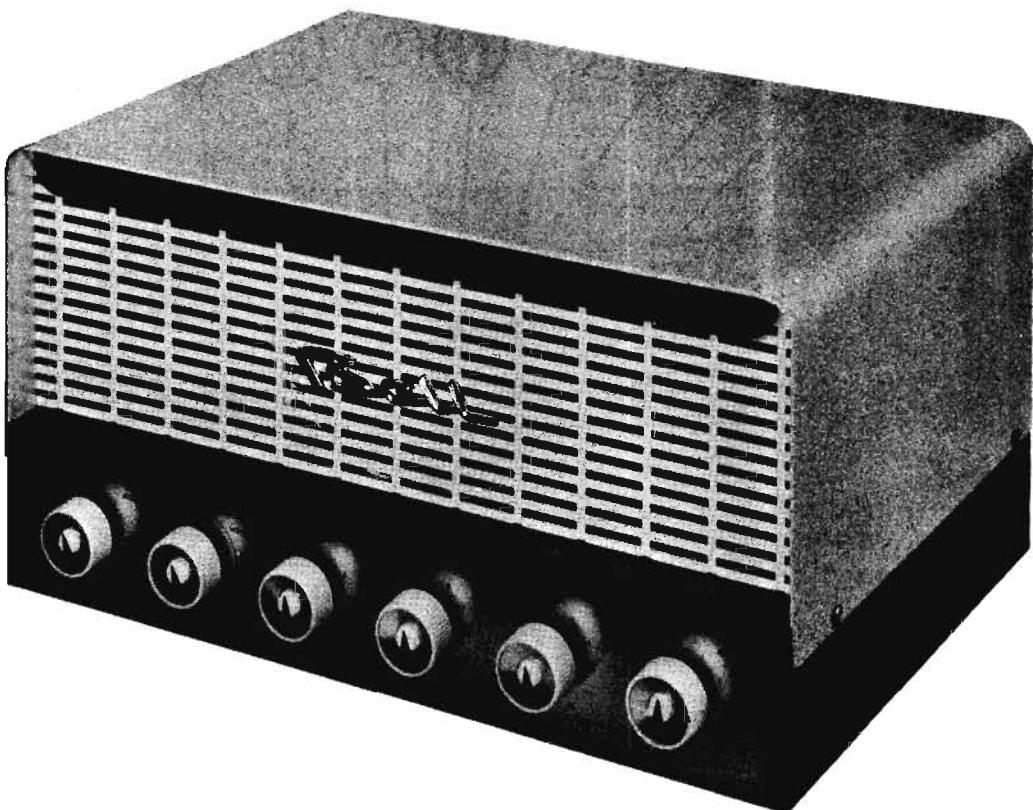


Fig. 14. Circuit using negative feedback for compensation.

compensation can be made to follow almost any desired curve if the appropriate network of resistors and capacitors is inserted in the feedback circuit. The values shown in Fig. 14 have been used for RIAA record compensation.

The same basic action is used with tone controls that employ negative feedback to control frequency response. A variety of such tone-control circuits are used, and some of them can appear to be very elaborate, but they all use the frequency-selective feedback action.

The definite advantage of negative feedback in equalizing circuits is that, in addition to the compensation obtained, distortion and noise are reduced by the action of the feedback.



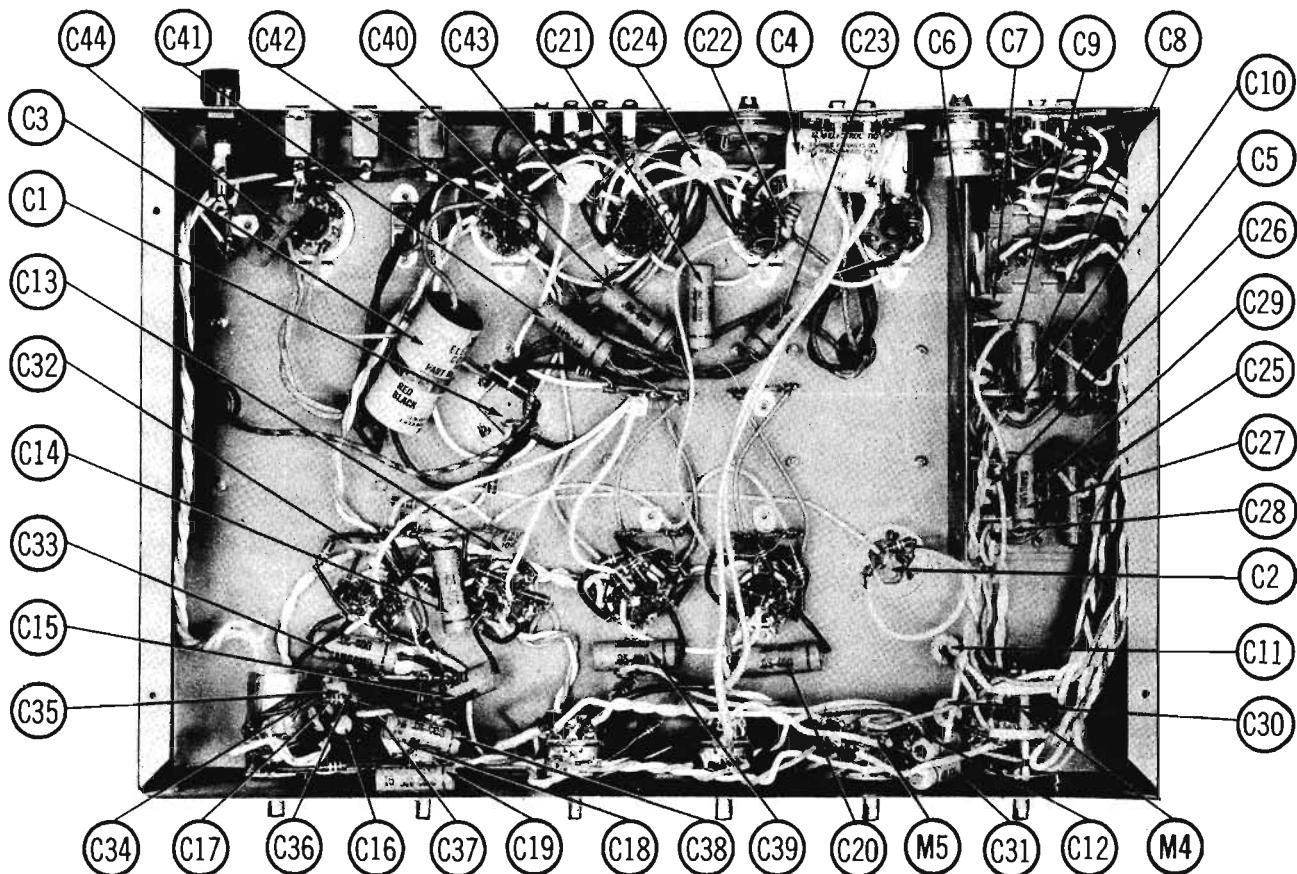
BELL SOUND  
MODEL 3DT (G)

TRADE NAME	Bell Sound Model 3DT (G)	
MANUFACTURER	Bell Sound Systems, Inc., 555 Marion Road, Columbus 7, Ohio.	
TYPE SET	AC Operated 8 Channel Binaural Amplifier	
TUBES	Eleven	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.1 Amp @ 117 Volts AC (120 Watts)

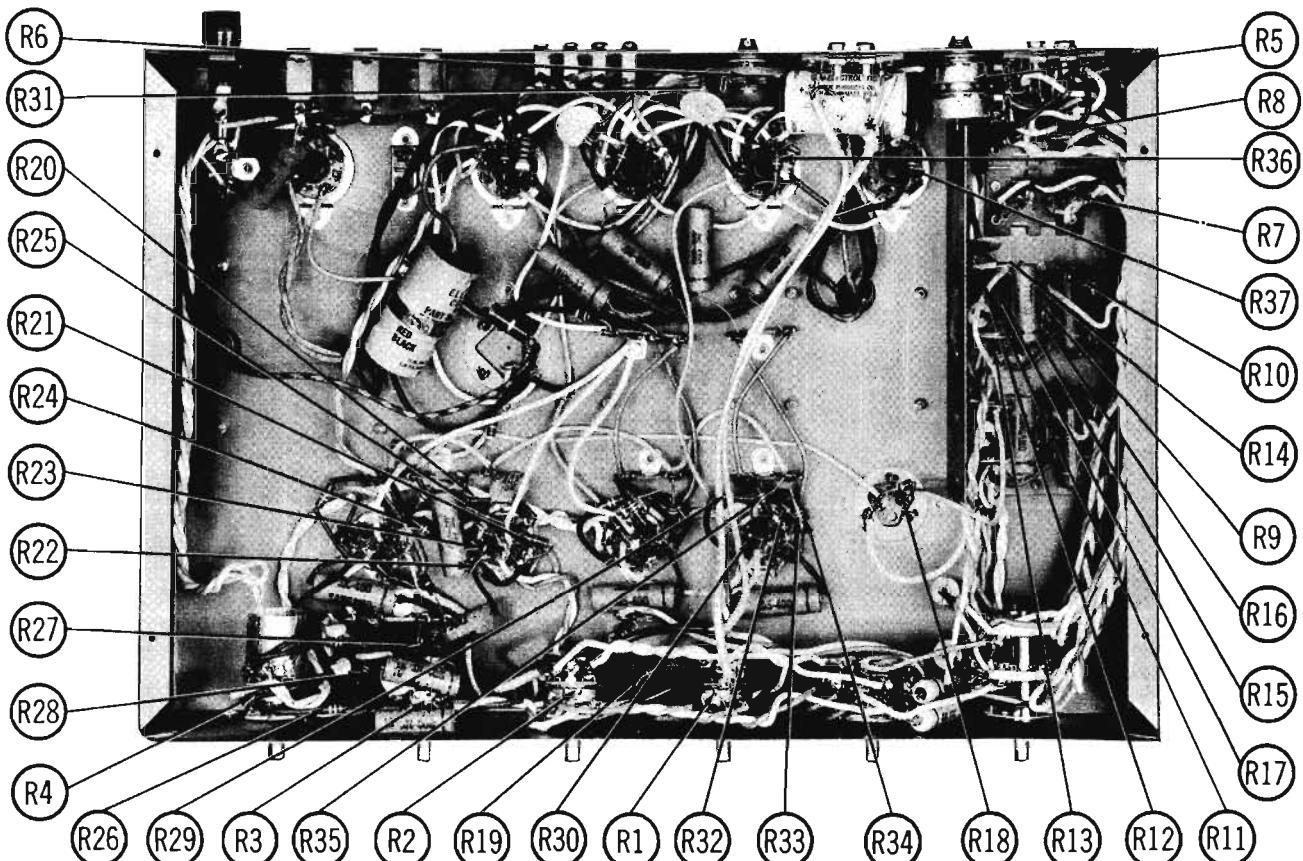
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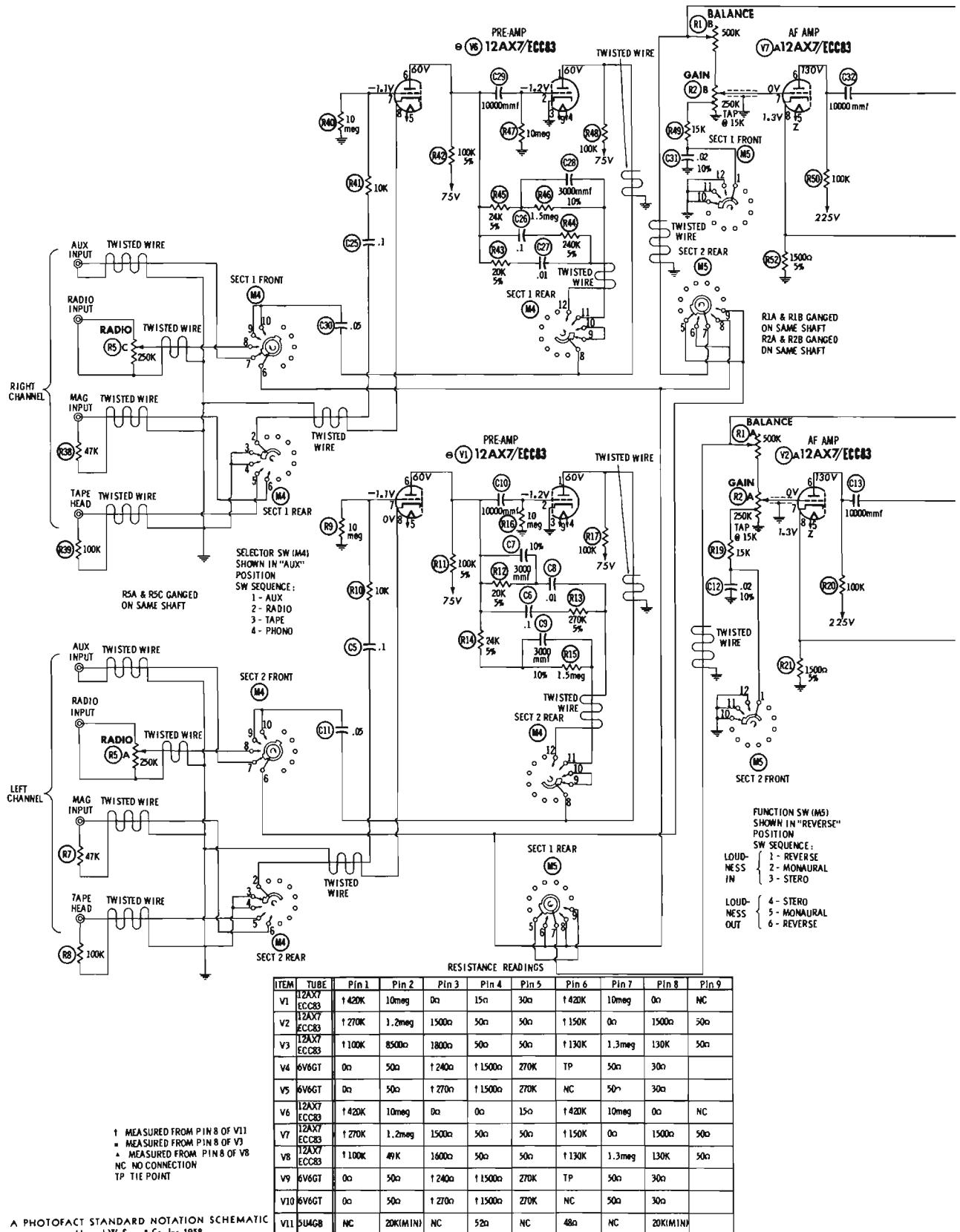
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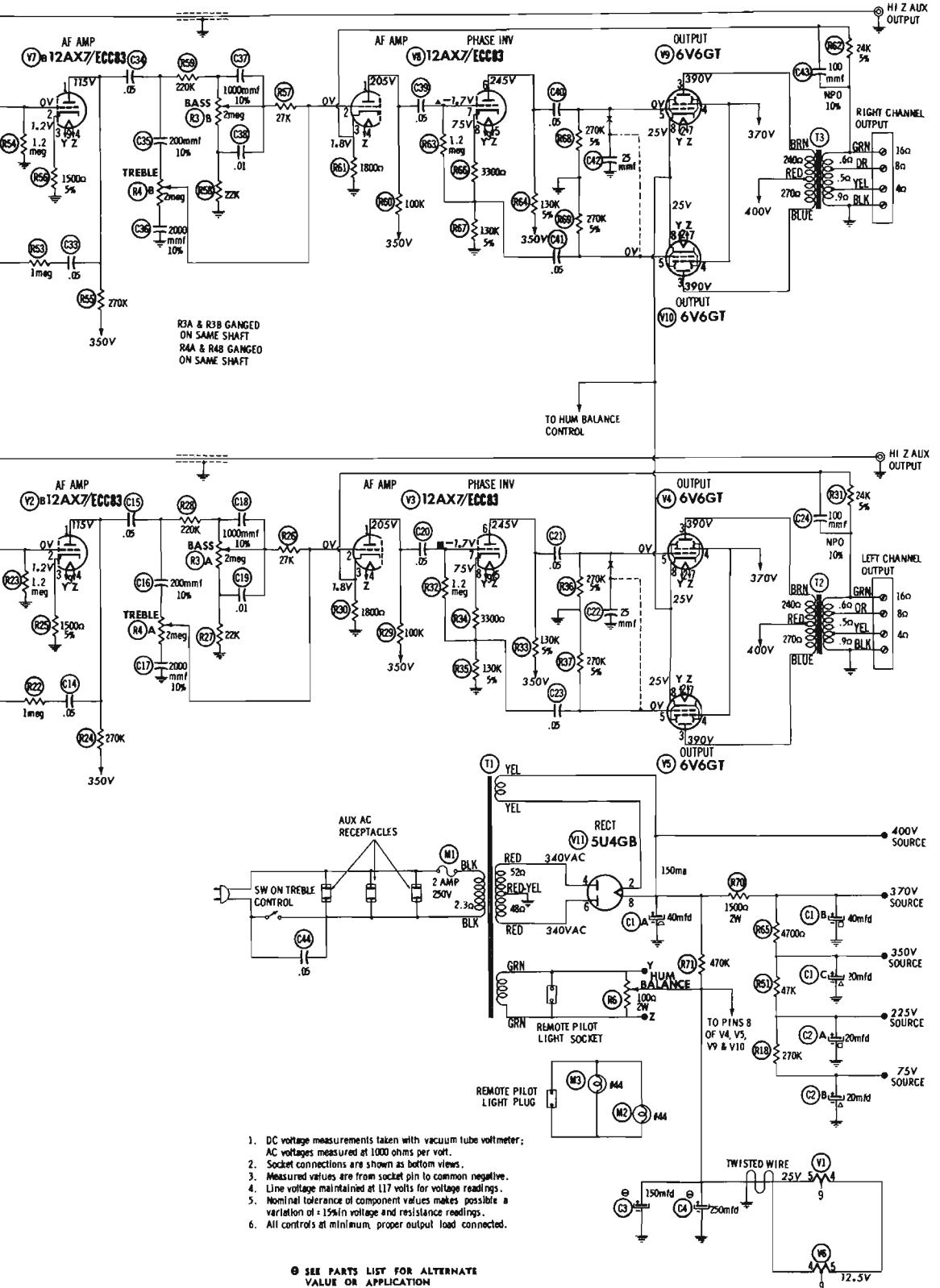


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

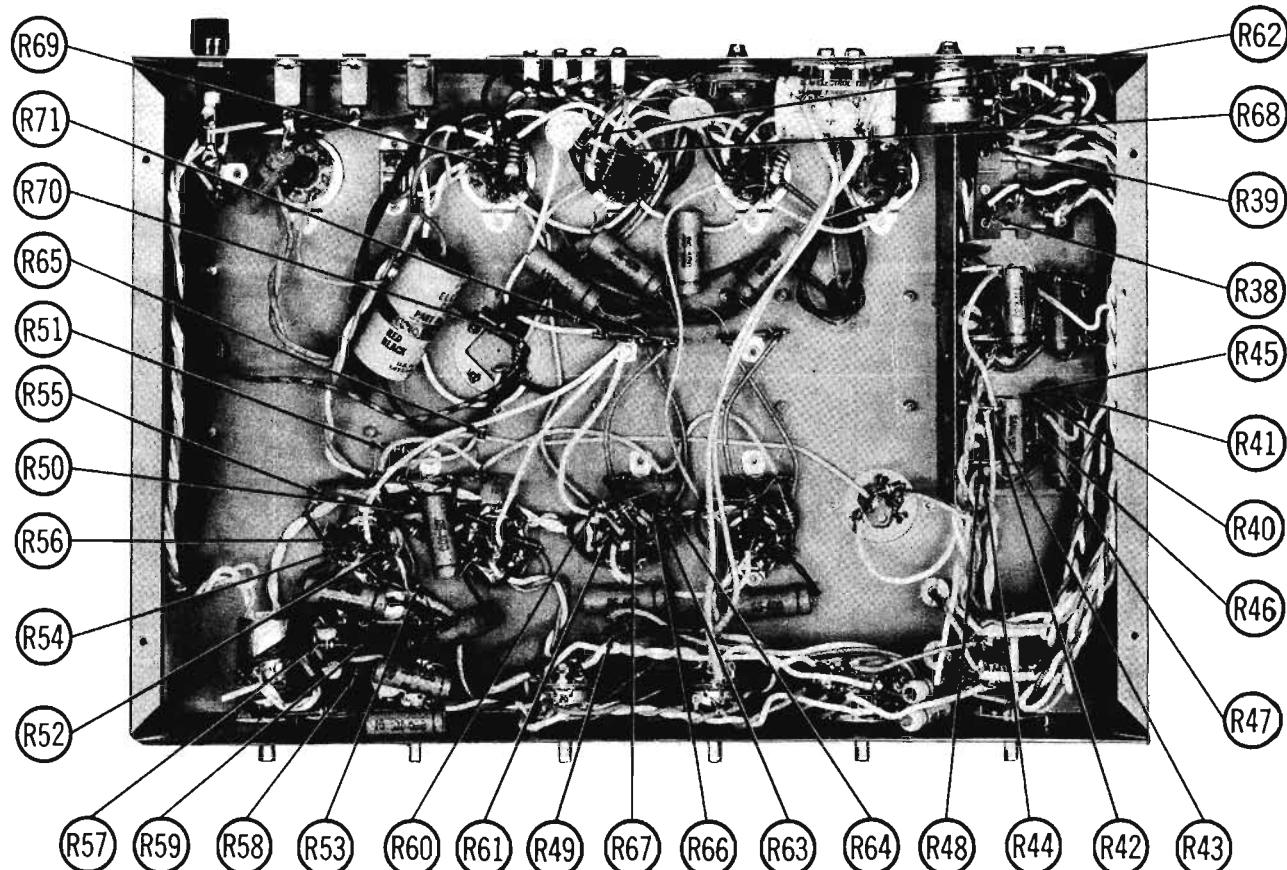


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION





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 of component values makes possible a variation of +15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Left Channel Preamp.	12AX7/ECC83 ①
V2	AF Amplifier	12AX7/ECC83
V3	AF Amp.-Phase Inv.	12AX7/ECC83
V4	Output	6V6GT
V5	Output	8V8GT

① Some versions may use 12AY7 in this application

ITEM No.	USE	TYPE
V6	Right Channel Preamp.	12AX7/ECC83 ①
V7	AF Amplifier	12AX7/ECC83
V8	AF Amp.-Phase Inv.	12AX7/ECC83
V9	Output	6V6GT
V10	Output	6V6GT
V11	Rectifier	5U4GB

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Bell Sound PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAUDE PART No.
C1A	.40	450		AFB3-43-50	CO344	FP376, 9	TMT-39	T-165 LMT-4610	TVL-3786
B	.40	450						MS-23	
C2A	.40	450						MS-23	
B	.20	450		AFH2-51	BO400	FP234	TMD-50	D-215	TVL-2756
C3	.150	50		PR560V150	BR1505	TC495	TD-150-50	MT-15150	TVA-1511
C4	.250	50	①	PR560V250	BR1505	TC50025	TD-260-50	S-057	TVA-1512

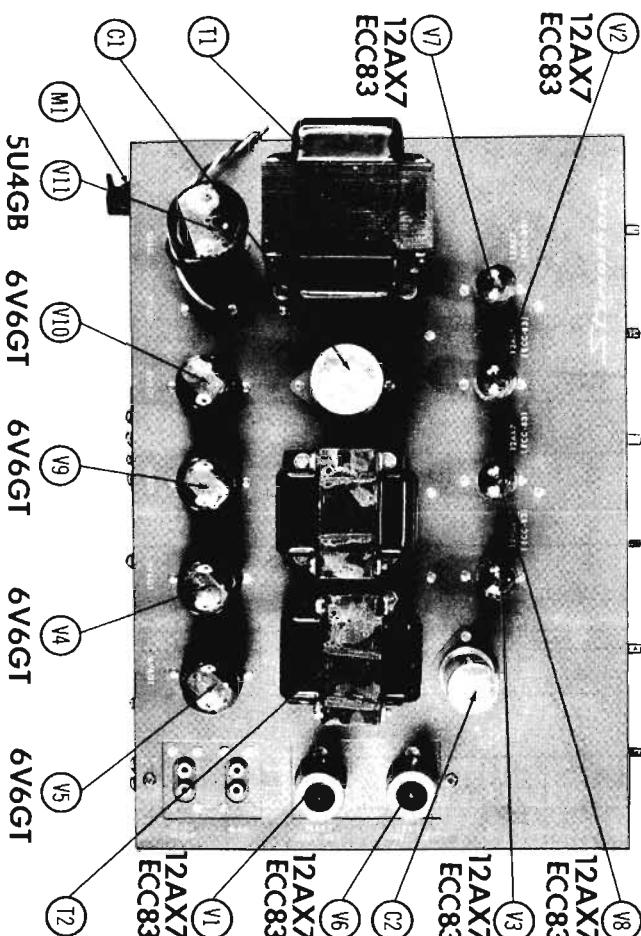
① When C3 is 500μfd., C4 is not used.

## 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-DUBLINER PART No.	MALLORY PART No.	SPRAUDE PART No.	
C5	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C6	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C7	3000			P488N-01	D6-103	IR5D	MCB461	MS-23	10%
C8	.01	400				CUB481	GRM-411	4TM-S1	
C9	3000					IR5D3	MCB461	MS-23	
C10	10000			BPD-01	DD-103	BYA481	DC511	SHK-S1	
C11	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C12	.05	400				IR5D5	MCB461	MS-23	
C13	.05	400		P488N-01	DD-103	BYA481	DC511	SHK-S1	
C14	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C15	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C16	.200			P488N-05	DF-503	IR5D5	MCB457	MS-22	
C17	2000					IR5D5	MCB457	MS-22	
C18	1000					IR5D5	MCB457	MS-21	
C19	.01	400		P488N-01	DD-103	IR5D1	GRM-411	4TM-S1	
C20	.05	400		P488N-05	DF-503	IR5D5	GRM-415	4TM-S5	
C21	.05	400		P488N-05	DF-503	IR5D5	GRM-415	4TM-S5	
C22	.25			S125	DM-250	L76Q25	SGA-Q25		
C23	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C24	.100			NPO-D1100	TCZ-100	C10TC	ZT-531	STCC-T1	
C25	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C26	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C27	.01	400		P488N-01	DD-103	CUB481	GRM-411	4TM-S1	
C28	3000					IR5D3	MCB461	MS-23	
C29	10000			BPD-01	DD-103	BYA481	DC511	SHK-S1	
C30	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C31	.02	400				IR5D5	MCB461	MS-23	
C32	10000			P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C33	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C34	.05	400		P488N-05	DF-503	IR5D5	MCB457	MS-22	
C35	.200					IR5D5	MCB457	MS-22	
C36	2000					IR5D5	MCB457	MS-21	
C37	.05	400		P488N-01	DD-103	CUB481	GRM-411	4TM-S1	
C38	.01	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C39	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C40	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C41	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	
C42	.25			S125	DM-250	L76Q25	SGA-Q25		
C43	.100			NPO-D1100	TCZ-100	C10TC	ZT-531	STCC-T1	
C44	.05	400		P488N-05	DF-503	CUB485	GRM-415	4TM-S5	

## CHASSIS—TOP VIEW



# PARTS LIST AND DESCRIPTIONS (Continued)

## CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES	
	RESISTANCE	WATTS	Bell Sound PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A B	500K 500K		2006SP121		B-1041			
R2A B	250K 250K		2006SP122			Q13-133 M13-133	UR1295	Balance Balance (G), Tap@15K Gain, Tap@15K
R3A B	1meg 2meg		2006SP120			Q13-139 M13-139	UR1874	Base Base Treble
R4A B	2meg 2meg		2006SP119			Q13-139 M13-139	UR1875	Base Treble
R5A B	250K 250K		B-2006SP123	BB-103	AD47-250K-2	Q13-130 M13-130	R100L	Radio input adjust. Radio input adjust.
R6A B	80ft 100ft		2(WW)	B-2006SP141	Not Req. Not Req. W1010 Not Req.	FRB-1/4 A43-100 FRB-1/4	WPK100 Not Req.	Hum Balance

## 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		OHMS	WATT		
R7	47K					R40	10meg			
R8	100K					R41	10K			
R9	10meg					R42	100K %			
R10	10K					R43	20K %			
R11	100K %					R44	240K %			
R12	90K %					R45	24K %			
R13	270K %					R46	1.5meg			
R14	24K %					R47	10meg			
R15	1.5meg					R48	100K			
R16	10meg					R49	15K			
R17	100K					R50	100K			
R18	170K					R51	47K			
R19	10K					R52	10000 %			
R20	100K					R53	1meg			
R21	15000 %					R54	1.2meg			
R22	1meg					R55	270K			
R23	1.2meg					R56	15000 %			
R24	270K					R57	27K			
R25	16000 %					R58	22K			
R26	27K					R59	220K			
R27	32K					R60	18K			
R28	100K					R61	18000 %			
R29	100K					R62	24K %			
R30	18000					R63	1.2meg			
R31	24K %					R64	120K %			
R32	1.2meg					R65	47000			
R33	130K %					R66	33000			
R34	33000					R67	130K %			
R35	130K %					R68	270K %			
R36	270K %					R69	270K %			
R37	100K %					R70	15000			
R38	47K					R71	470K	2		
R39	100K									

## TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Bell Sound PART No.	Holderson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thorderson PART No.	
T1	117V ②1.1A	880VCT ②150A	5V ③A	B-20373		P-3173		PC8422	22R33	R-18A
	SEC. 3	SEC. 4	SEC. 5							
	6.3V ③.5A									

# PARTS LIST AND DESCRIPTIONS (Continued)

## TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES	
	PRL	SEC.	Bell Sound PART No.	Holderson PART No.	Merit PART No.	Rom PART No.	Stancor PART No.	Thorderson PART No.	Triad PART No.	
T2	6500Ω	(AG) Tap CT	B-20374					A-3304	22R68 ①	① Tape 25Ω & 500Ω tapes
T3	6500Ω	160 Tap CT	B-20374					A-3304	22R68 ①	①

## FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA			
			Bell Sound PART No.		LITTELFUSE PART No.	
			FUSE	HOLDER	FUSE	HOLDER
M1	SAG	1A 250V			313002, (SAG 2A 250V)	342001 AGC2 HKP

## MISCELLANEOUS

ITEM No.	PART NAME	Bell Sound PART No.	NOTES
M2	Pilot Lamp		444
M3	Pilot Lamp		444
M4	Switch		Select (Input) (Rotary wafer type)
M5	Switch		Function (Rotary wafer type)

## WIRING DATA

General-use Unshielded Book-up Wire .....	Use BELDEN No. 8830 (Solid) Available in Ten Colors
Power Cord .....	Use BELDEN No. 1765-B (8 Ft. Length) 1721-K (7 1/2 Ft. Length)
Low-Loss Shielded Lead (Interconnecting) .....	Use BELDEN No. 8401
Phone Pick-up Arm Cable .....	Use BELDEN No. 8430 (Two Conductor - Twisted)

**PHOTOFACT<sup>\*</sup> Folder**



**BELL SOUND  
MODEL 2315**



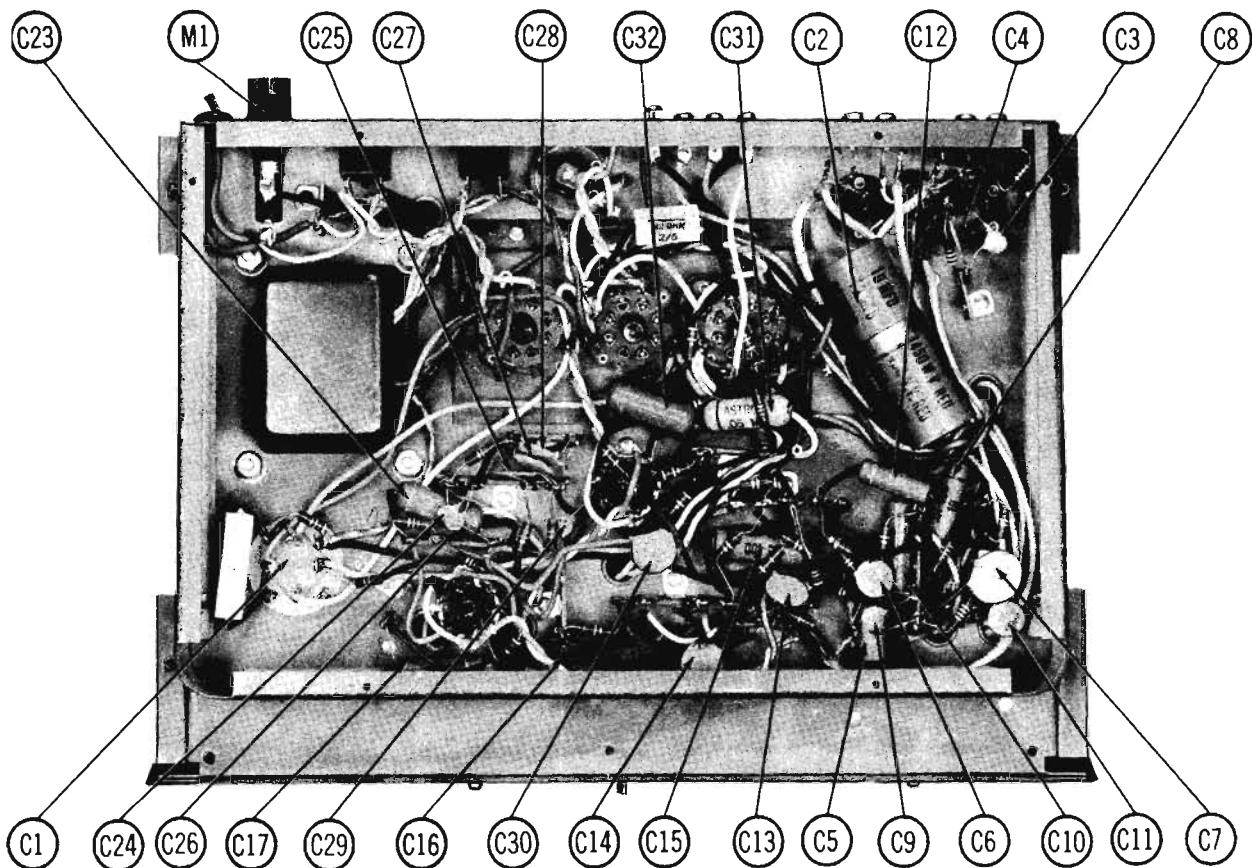
TRADE NAME	Bell Sound Model 2315	
MANUFACTURER	Bell Sound Systems, Inc., 555 Marlin Road, Columbus 7, Ohio	
TYPE SET	AC Operated 6 Channel 12 Watt Audio Amplifier	
TUBES (Six)	Types 12AX7/ECC83 Phono Preamplifier, 12AX7/ECC83 AF Amplifier, 12AX7/ECC83 AF Amp.-Phase Inv., (2) 6V6GT Output, 5Y3GT Rectifier	
POWER SUPPLY	110-120 Volts AC -60 Cycles	RATING .74 Amp. @ 117 Volts AC (75 Watts)

**BELL SOUND  
MODEL 2315**

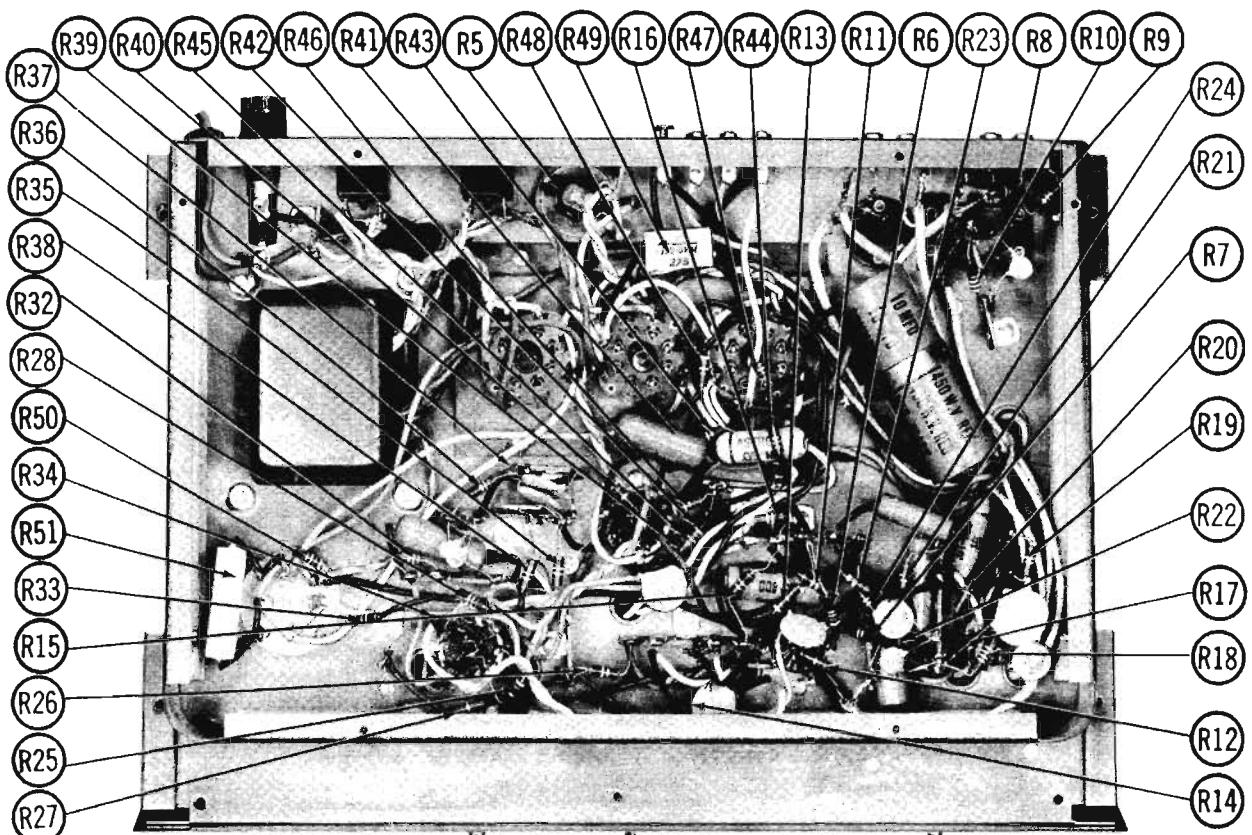
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**CHASSIS BOTTOM VIEW CAPACITOR AND MISCELLANEOUS IDENTIFICATION**



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**

## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Phono Preamplifier	12AX7/ECC83
V2	AF Amplifier	12AX7/ECC83
V3	AF Amp. - Phase Inv.	12AX7/ECC83

ITEM No.	USE	TYPE
V4	Output	6V6GT
V5	Output	6V6GT
V6	Rectifier	5Y3GT

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	BELL SOUND PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CLA	.40	450							
B	.15	450							
C	.10	450							
D	.100	50							
C2A	.10	450							R2555 *
B	.10	450							

\* 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.

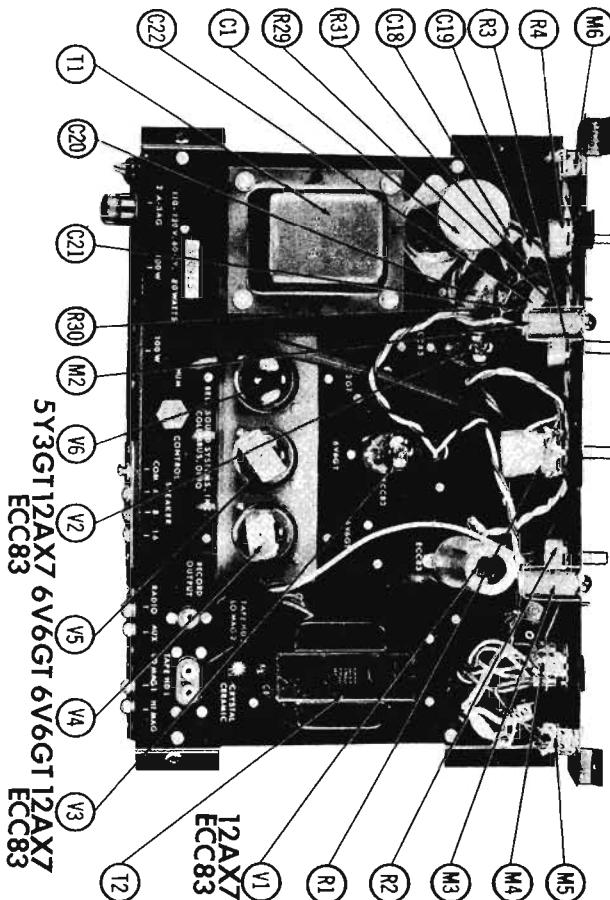
ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	BELL SOUND PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	IRC PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	200					TCZ-200	LJ072	ED-200	MCB237	MS-32
C4	68					TCZ-88	CIQ98C	TCO-68	5TCC-Q68	10% NPO
C5	.05					DF-503	CUB465		4TM-S5	10%
C6	2400						IRSD24		MS-224	10%
C7	5000								MS-25	10%
C8	.05								GEM-181	10%
C9	.70								MS-324	10%
C10	.025	400							MS-224	10%
C11	2400								MS-224	10%
C12	.01	400							GEM-181	10%
C13	100000								DCS11	5HK-S1
C14	100000								DCS11	5HK-S1
C15	.05	400				BPD-01	BYA851	ED-01	GEM-415	4TM-S5
C16	.1	200				DD-103	BYA851	ED-01	MCB201	2TM-P1
C17	.05	400				D-603	CUB465		GEM-181	4TM-S5
C18	240					D-704	CUB2P1		MS-324	10%
C19	2400					D-704	CUB465		MS-224	10%
C20	.01	400				D-704	LJ072	ED-240	GEM-181	10%
C21	1000					D-704	TCY20C242J		DCS11	5HK-S1
C22	.68					D-704			DCS11	5HK-S1
C23	.1					D-704			DCS11	5HK-S1
C24	.70	200				D-704			DCS11	5HK-S1
C25	100000					D-704			DCS11	5HK-S1
C26	.70					D-704			DCS11	5HK-S1
C27	100000					D-704			DCS11	5HK-S1
C28	100000					D-704			DCS11	5HK-S1
C29	210					D-704			DCS11	5HK-S1
C30	100000					D-704			DCS11	5HK-S1
C31	.05	400				D-704	BYA851	ED-01	GEM-415	4TM-S5
C32	.05	400				D-704	CUB465		GEM-415	4TM-S5

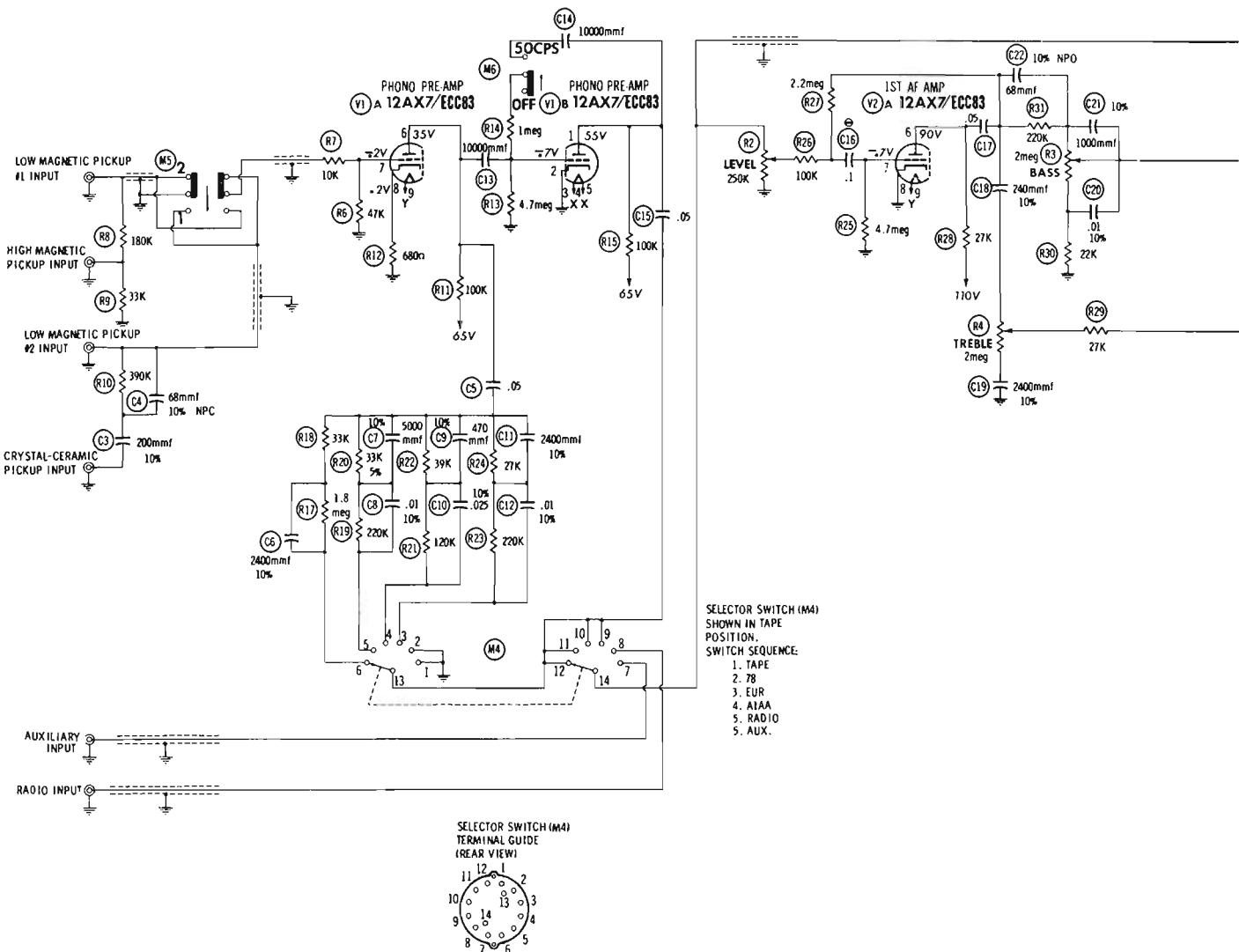
Note 1. Some versions may use .01mfd in this application.

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	BELL SOUND PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	150K	1				B-20066164			Loudness, Tap @ 100K & 150K
R1B	Switch								Level
R2A	250K					B-50	A47-250K-S	QU-130	
R2B	Shaft						FB-3	Not Req.	U46
R3A	2meg	1/2				B-76	A47-2meg-Z	Q5-130	Not Req.
R3B	Shaft						FS-3	Not Req.	U56

### CHASSIS—TOP VIEW





- 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 of component values makes possible a variation of ±15% in voltage and resistance readings.
- All controls at minimum, proper output load connected.

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

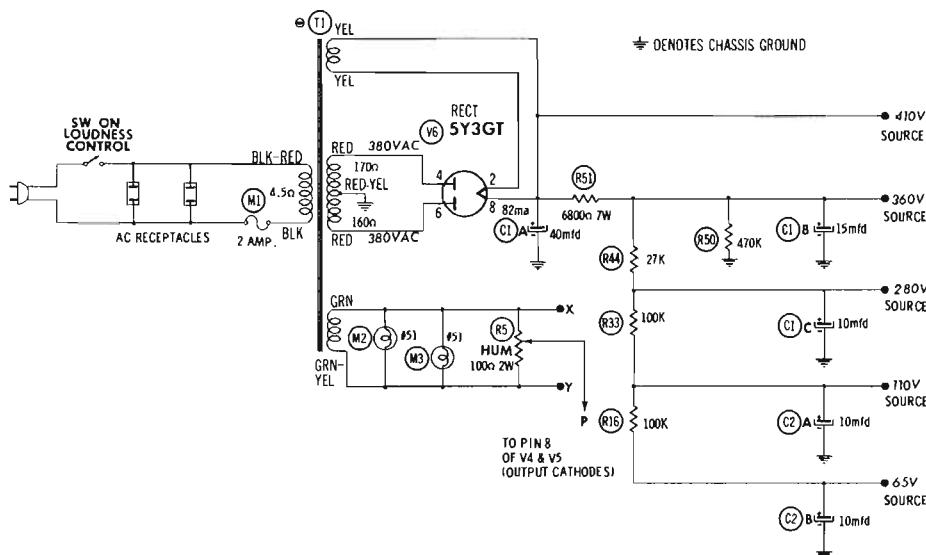
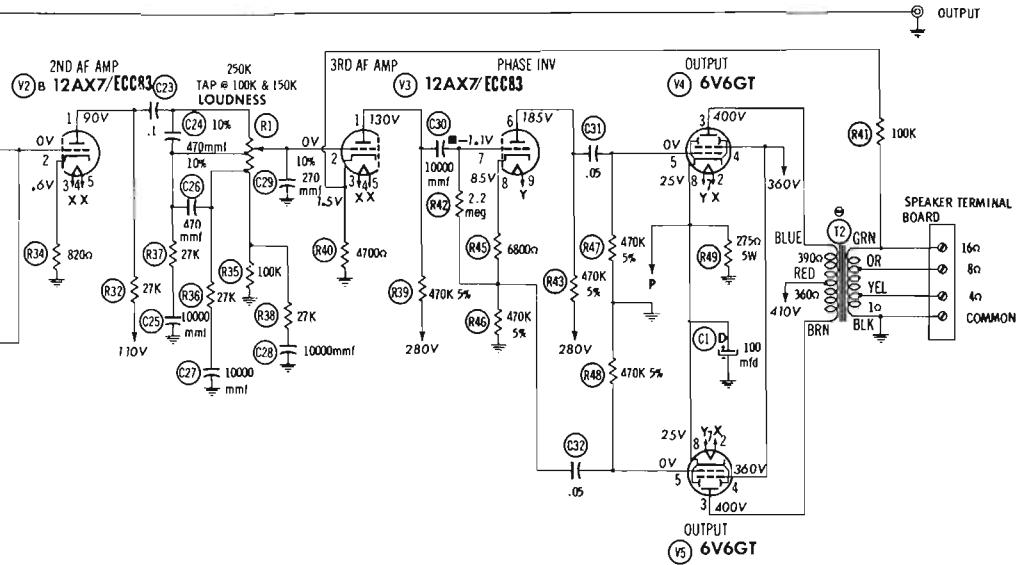
RESISTANCE READINGS										
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7 ECC83	±330K	4.7meg	0Ω	300Ω	300Ω	±330K	47K	680Ω	300Ω
V2	12AX7 ECC83	±160K	22K	820Ω	300Ω	300Ω	±160K	4.7meg	0Ω	300Ω
V3	12AX7 ECC83	±500K	100K	4200Ω	300Ω	300Ω	±500K	2.7meg	470K	300Ω
V4	6V6GT	TP	300Ω	±390Ω	±6800Ω	470K	TP	300Ω	275Ω	
V5	6V6GT	TP	300Ω	±360Ω	±6800Ω	470K	NC	300Ω	275Ω	
V6	5Y3GT	NC	20K(Min)	NC	170Ω	NC	160Ω	NC	20K(Min)	

† MEASURED FROM PIN 8 OF V6

■ MEASURED FROM PIN 8 OF V3

NC NO CONNECTION

TP TIE POINT



## PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS (cont)

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES	
	RESISTANCE	WATTS	BELL SOUND PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R44 B	2meg Shaft	1/2	B-2006BP150	B-78	A47-2meg-Z	Q13-150	U55	Treble
R5A B	100Ω Shaft	2	B-2006BP141	Not Req. WN-101	XG-3 A43-100	Not Req.	C100P *	Hum (Wire Wound)

\* Use #203 & #212 Fiber Insulating Washers.

### 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		OHMS	WATT		
R6	47K					R29	27K			
R7	10K					R30	22K			
R8	180K					R31	220K			
R9	33K					R32	27K			
R10	300K					R33	100K			
R11	100K					R34	820Ω			
R12	100Ω					R35	100K			
R13	4.7meg					R36	27K			
R14	1meg					R37	27K			
R15	100K					R38	27K			
R16	100K					R39	470K 5%			
R17	1.6meg					R40	4700Ω			
R18	33K					R41	100K			
R19	220K					R42	2.2meg			
R20	33K 5%					R43	470K 5%			
R21	33K					R44	27K			
R22	39K					R45	6800Ω			
R23	220K					R46	470K 5%			
R24	27K					R47	470K 5%			
R25	4.7meg					R48	470K 5%			
R26	100K					R49	275Ω	5		
R27	2.2meg					R50	470K			
R28	27K					R51	6800Ω	7		

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	BELL SOUND PART No.	Hollderson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	
T1	117V ② .74A	740VCT ② .082A	5V ② 2A	B20368 ①	P831 ②			PM8409 ②	24R04 ②	R-11B ②

① Part #B20369 used for 50% operation.

② Tape center tap on 6.3V winding.

## PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES	
	PRI.	SEC.	BELL SOUND PART No.	Hollderson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.	
T2	7800Ω	16Ω	32B8 ①							① Alternate Part #B20370
	CT	Tap ②	8Ω, 4Ω							

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA		NOTES
			BELL SOUND PART No.	LITTELFUSE PART No.	
			FUSE	HOLDER	
M1	3AG	2A 250V	312002, (3AG 2A 250V)	342001	AGC2 HKP

### MISCELLANEOUS

ITEM No.	PART NAME	BELL SOUND PART No.	NOTES
M2	Pilot Lamp		#51
M3	Pill Lamp		#51
M4	Switch		Selector (Rotary Wave Type)
M5	Switch		Input (Slide Type DPDT)
M6	Switch		Filter (Slide Type DPDT)

### 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
Low-Loss Shielded Lead (Interconnecting)	.....	1765-B (6 Ft. Length)
Phono Pick-up Arm Cable	.....	1725-K (7 1/2 Ft. Length)

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)

Low-Loss Shielded Lead (Interconnecting) ..... Use BELDEN No. 1725-K (7 1/2 Ft. Length)

Phono Pick-up Arm Cable ..... Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

# PHOTOFAC<sup>\*</sup> Folder

\*TRADE MARK



## CHALLENGER MODELS CHA33, CHA33Y



**CHALLENGER  
MODELS CHA33, CHA33Y**

TRADE NAME	Challenger Models CHA33, CHA33Y	
MANUFACTURER	Challenger Amplifier Co., P.O. Box 500, Paramus, N.J.	
TYPE SET	AC Operated 3 Channel 33 Watt Audio Amplifier (Model CHA33Y has 3 Speed Manual Record Player)	
TUBES (Seven)	Types 12AX7/ ECC83 Mic 1-Mic 2 Preamplifier, 6AV6 Mixer, 12AX7/ ECC83 AF Amp. -Phase Inv., (2) 6L6GB Output, (2) 5Y3GT Rectifier	
POWER SUPPLY	110-120 Volt AC-60 Cycle	RATING 1.1 Amp. @ 117 Volt AC (120Watts)

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

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## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Mic 1-Mic 2 Preamplifier	12AX7// ECC83
V2	Mixer	6AV6
V3	AF Amp. - Phase Inv.	12AX7// ECC83
V4	Output	6L6GB

ITEM No.	USE	TYPE
V5	Output	6L6GB
V6	Rectifier	5Y3GT
V7	Rectifier	5Y3GT

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	CHALLENGER PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MAILORY PART No.	PYRAMID PART No.	SAANGAO PART No.	SPRAGUE PART No.
C1	16	500							
C2	5	450							
B	5	450							
C	5	450							
D	5	450							
C3	50	50							
			PR650V50	BR505	TC39	TD-50-50	MT-0550	TVA-1308	

## FIXED CAPACITORS

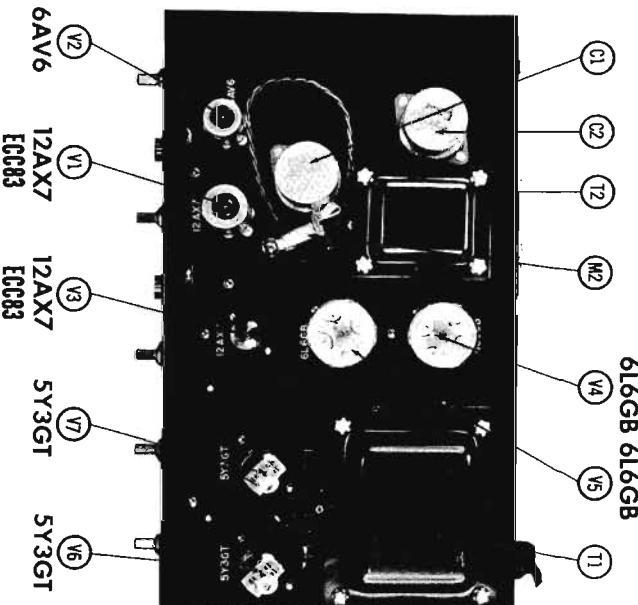
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	CHALLENGER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.093	200		P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33		
C5	.093	400		P488N-033	DF-303	CUB6S33	GEM-4133	6TM-S33		
C6	.093	200		P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33		
C7	.093	400		P488N-033	DF-303	CUB6S33	GEM-4133	6TM-S33		
C8	1	400		P488N-033	DF-104	CUB4V1	GEM-401	4TM-P1		
C9	270			D6-271	KR5727	ED-270	MS-327			
C10	2100				IRSD22	CY20C222K	MS-222	10%		
C11	1000				IRSD1	ED-1000	MCB255	MS-21		
C12	.0058	200				GP-5600				
C13	.093	200		P288N-033	D6-562		GEM-4133	6TM-S33		
C14	15000				DP-303	CUB6S33	BYA10G15	5HK-S15		
C15	.093	400		P488N-033	DP-303	CUB6S33	BYA10G15	6TM-S33		
C16	.093	400		P488N-033	DP-303	CUB6S33	BYA10G15	6TM-S33		
C17	2200				IRSD22	CY20C222K	MS-222	10%		

## CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	CHALLENGER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	2meg	1	V417	B-76	A47-2meg-Z	Q13-139	U55		Treble
B				Not Req.	FS-3	Not Req.	Not Req.		
C	Switch			KD-1	SWE-12	76-1	U5-28		
R2A	2meg	1	V413	B-76	A47-2meg-Z	Q13-139	U55		
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		
R3A	500K	1	V367	B-60	A47-500K-Z	Q13-133	U46		Base
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		
R4A	500K	1	V367	B-60	A47-500K-Z	Q13-133	U46		Phono
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		
R5A	500K	1	V367	B-60	A47-500K-Z	Q13-133	U46		Microphone 2
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		
R6A	500K	1	V367	B-60	A47-500K-Z	Q13-133	U46		Microphone 1
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING		CHALLENGER PART No.	NOTES	
	OHMS	WATT			
R6	3.3meg				
R7	220K				
R8	3.3meg				
R9	220K				
R10	100K				
R11	220K				
R12	270K				
R13	220K				
R14	470G				
R15	220K				
R16	100K				
R17	33K				
R18	.1K				
R19	220K				
R20	220K				
R21	390G				

ITEM No.	RATING		REPLACEMENT DATA				
	CHALLENGER PART No.	Hallidorex PART No.	Maurit PART No.	Siemcor PART No.	Thordorson PART No.	Triad PART No.	
T1	117V ① 1.1A ② .130A	800VCT ③ 4A	5V ④ 2.8A	6.3VCT ⑤ 2.8A	T385-2		R-24B

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA							
	PR1	SEC. 1	SEC. 2	SEC. 3	CHALLENGER PART No.	Hallidorex PART No.	Maurit PART No.	Siemcor PART No.	Thordorson PART No.	Triad PART No.	
T1	117V ① 1.1A ② .130A	800VCT ③ 4A	5V ④ 2.8A	6.3VCT ⑤ 2.8A	T385-2						R-24B

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA				NOTES
	CHALLENGER PART No.	Hallidorex PART No.	Maurit PART No.	Siemcor PART No.	Thordorson PART No.	Triad PART No.	
T2	5000Ω CT	70V ⑥ SEC. 2 ⑦ 16Ω ap ⑧ 8Ω & 4Ω	T279-1				

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA			
			CHALLENGER PART No.	ULTEIFUSE PART No.	BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER
M1	JAG	2A 250V S/B		313002 (JAG 2A 250V S/B)	342001	MDL2 EXCP

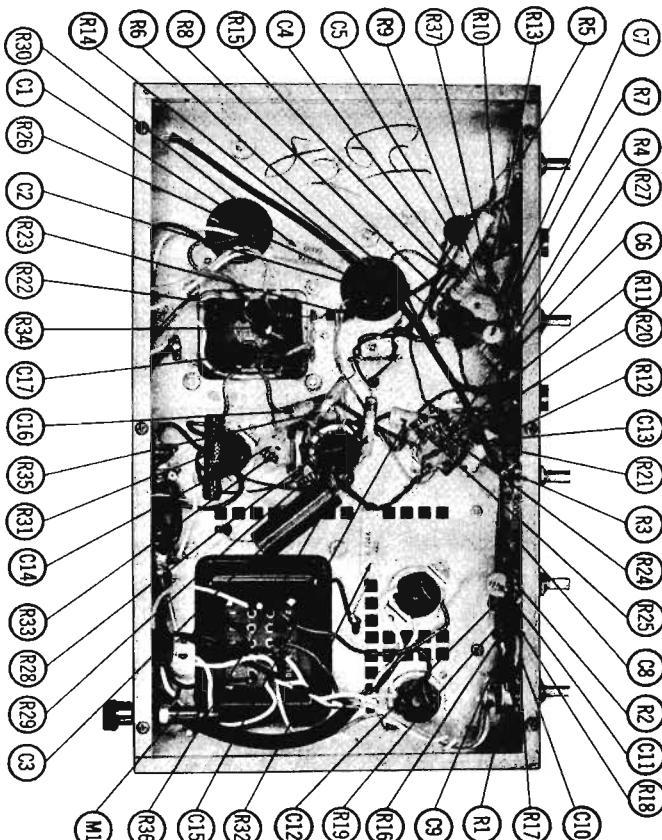
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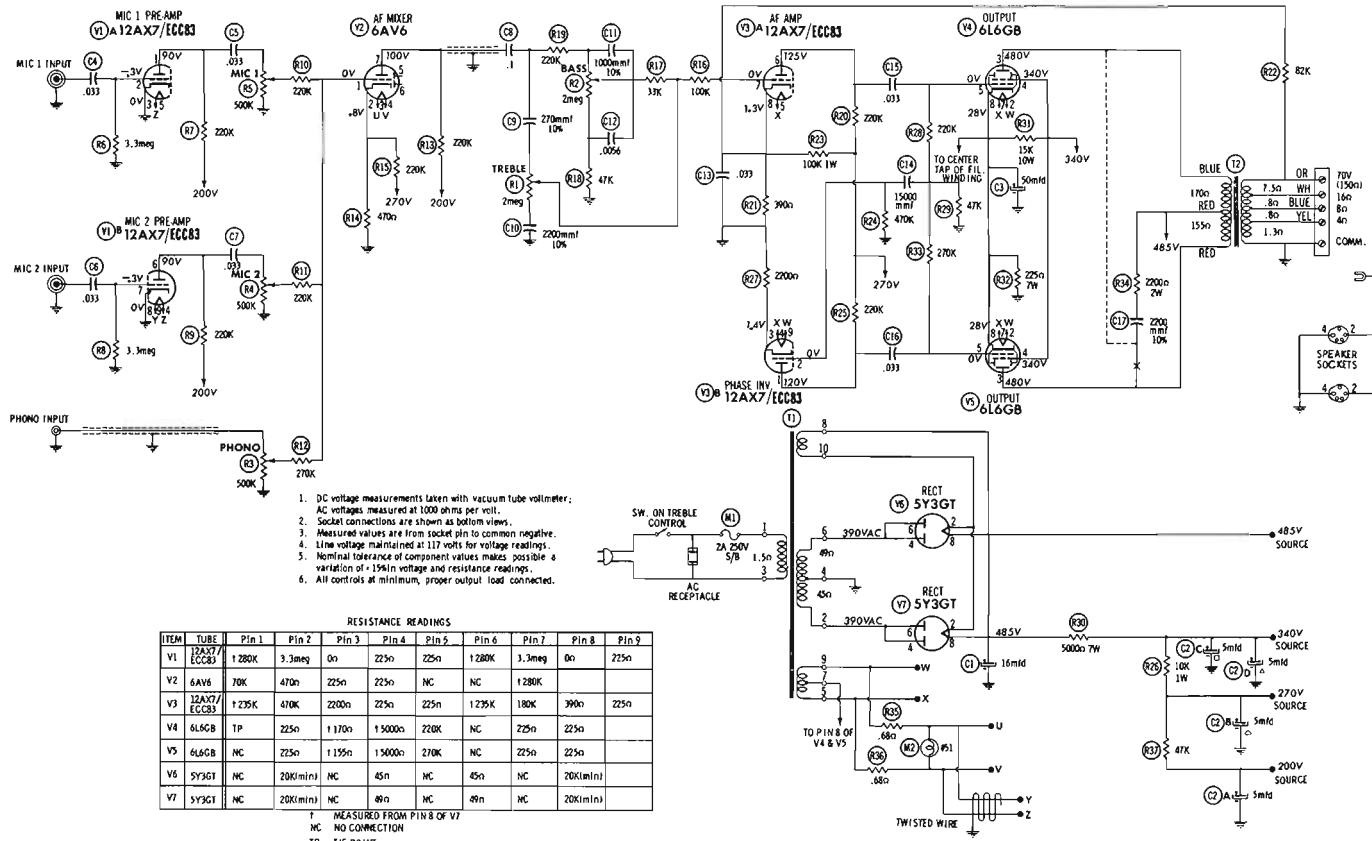
ITEM No.	PART NAME	CHALLENGER PART No.	NOTES
M2	Pilot Lamp		#51

### WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8630 (Solid) Available in Ten Colors 8624 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1785-B (6 Ft. Length) 1785-K (7 1/2 Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phone Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

## CHASSIS—BOTTOM VIEW







**DAVID BOGEN  
MODEL L60**

TRADE NAME	David Bogen Model L60
MANUFACTURER	David Bogen Co., Inc. P.O. Box 500, Paramus, N.J.
TYPE SET	AC Operated 6 Channel 60 Watt Audio Amplifier
TUBES	Twelve
POWER SUPPLY	110-120 Volts AC-60 Cycle      RATING 1.1 Amp. @ 117 Volts AC (130 Watts)

#### VOLTAGE REGULATOR ADJUSTMENT (R6)

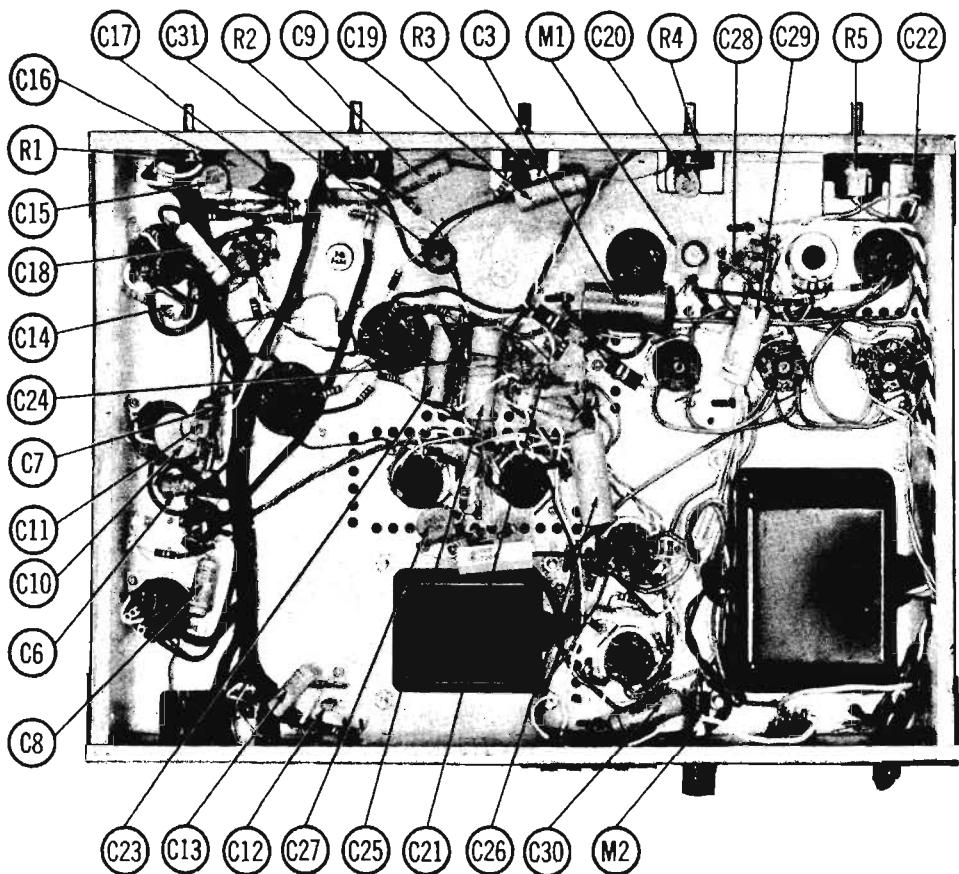
The voltage regulator (R6) should be adjusted if V5, V6, V7, V8 or V9 tubes are replaced.

1. Set "Volt Reg." Control (R6) and volume controls (R1, R2, R3) at minimum. Allow the amplifier to warm up for four minutes.
2. Using an accurate low range DC voltmeter, connect the positive lead to terminal 1 of the "CUR MON" test strip. Connect the negative lead to ground.
3. Turn the voltage regulator (R6) for a SLIGHT meter deflection. Measure the voltage at terminals 1, 2, 3, and 4 on the "CUR MON" strip. Keep the meter connected to that terminal which measures the highest voltage.
4. Turn the voltage regulator (R6) until the meter indicates .25 volt.

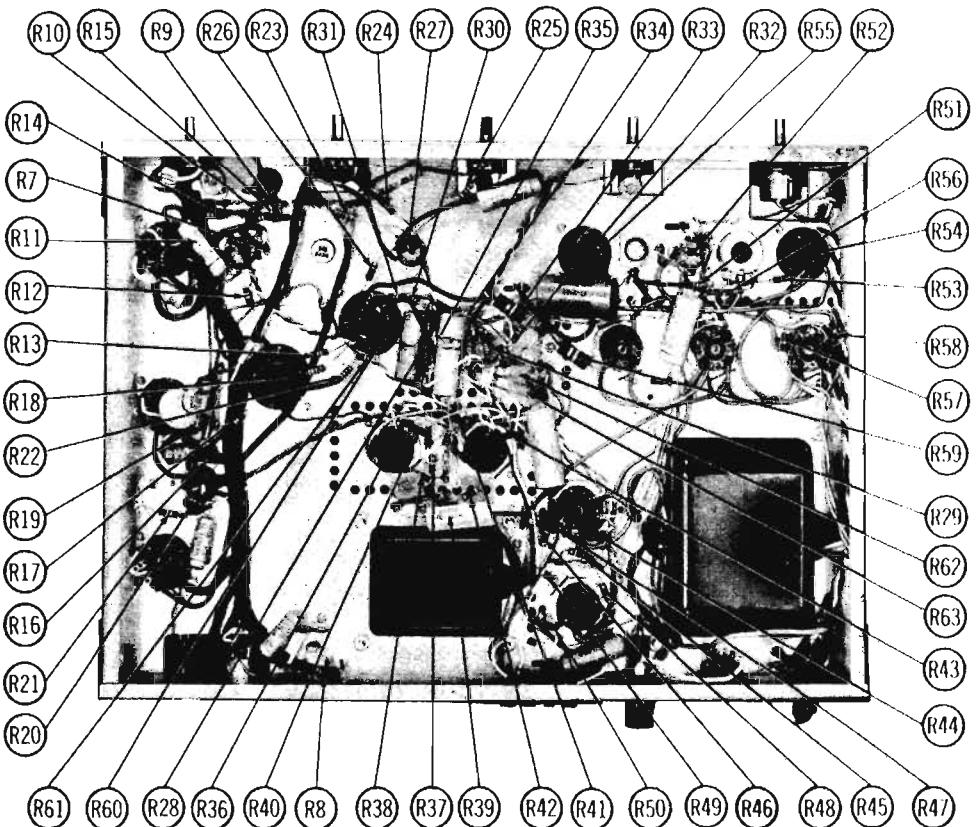
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**CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION**



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**

# **PARTS LIST AND DESCRIPTIONS**

## **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE
V1	Mic 1-Tuner-Phono Preamp.	12AX7 / ECC83
V2	Mic 2-Mic3 Preamplifier	12AX7 / ECC83
V3	AF Amplifier	6AV6
V4	AF Amp. -Phase Inv.	6UB
V5	Output	6AV5GA
V6	Output	6AV5GA

ITEM No.	USE	TYPE
V7	Output	6AV5GA
V8	Output	6AV5GA
V9	Volt. Reg. - Reg. Cont.	6CM7
V10	Rectifier	5Y3GT
V11	Rectifier	5Y3GT
V12	Rectifier	5Y3GT

## 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.
C1	30	400		A FH1-51	A0470	FP145	TMS-56	S-285	TVL-1720
C2	30	400		A FH1-51	A0470	FP145	TMS-56	S-285	TVL-1720
C3	50	100		PR3150V50	BR5015	TC49	TD-50-150	MT-1550	TVA-1414
C4A	± 200			A FH4-09	D0080	WP433.6	TMQ-9	Q-027	TVL-4759.7
B	5	200							
C	± 200								
D	5	200							
GSA	10	350							
B	10	350							
C	20	450							
D	20	450							
				A FH4-19-10	D0179.3	FP474.5	TMQ-113	Q-035 MT-4510	TVL-4826

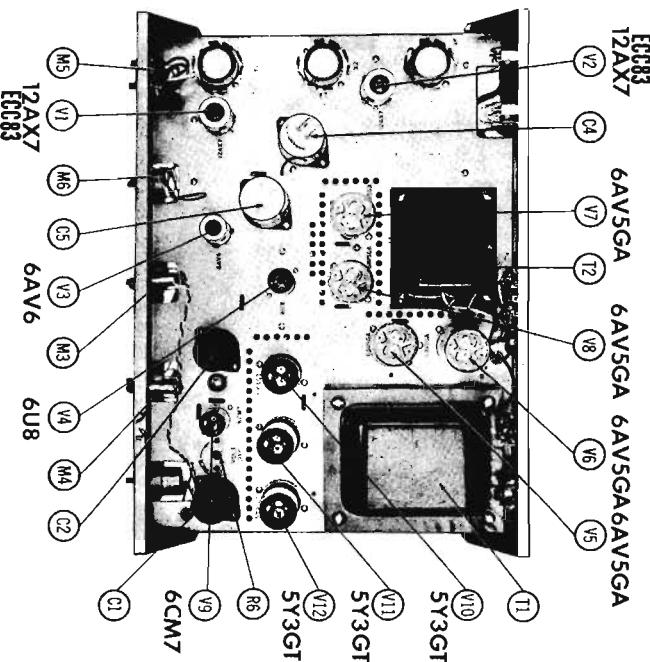
## **FIXED CAPACITORS**

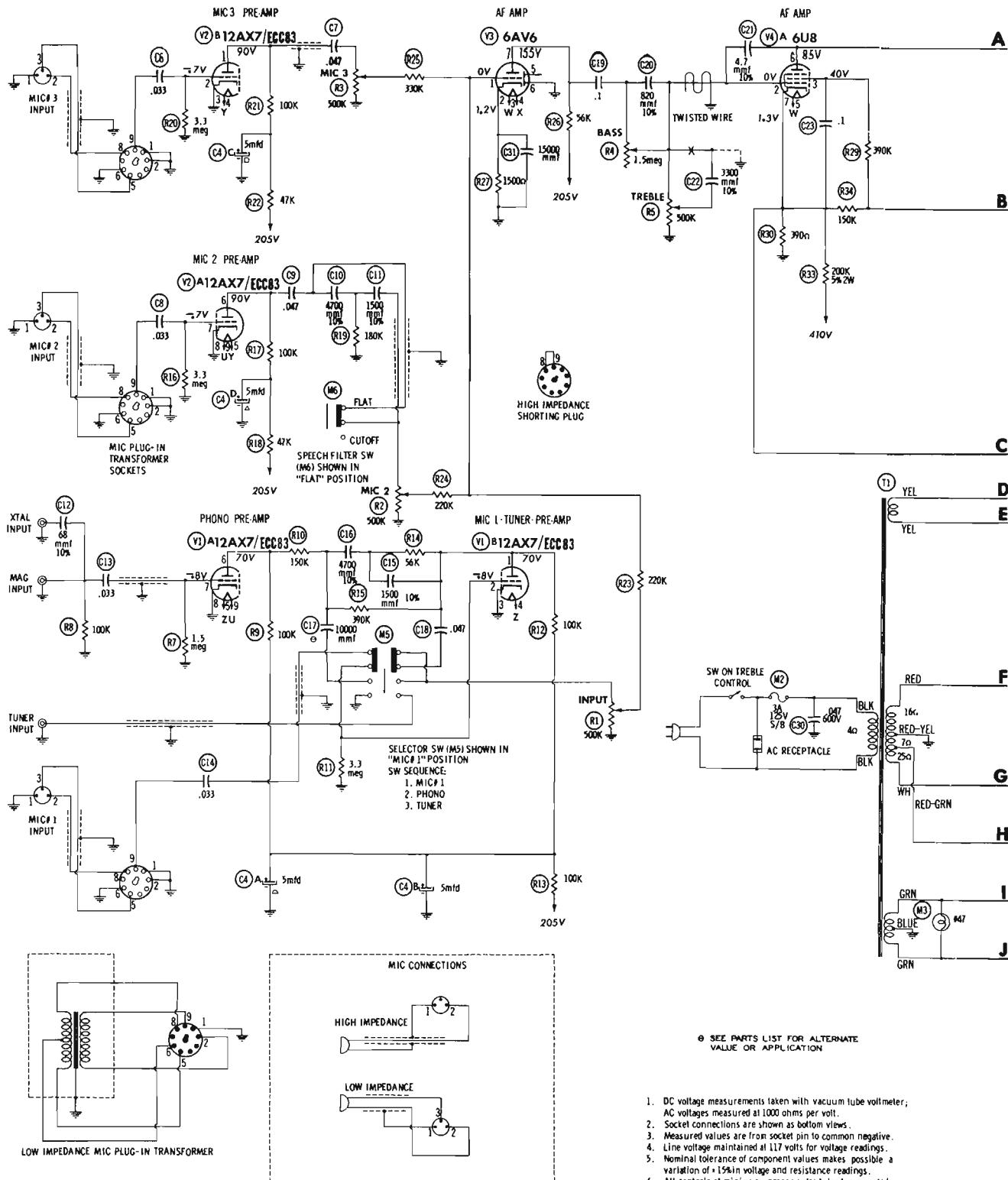
**Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.**

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	DAVID BOGEN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL- DUBLIUM PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	.033	200	P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33			
C7	.047	200	P288N-047	DF-503	CUB2S47	GEM-4147	6TM-S47			
C8	.033	200	P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33			
C9	.047	200	P288N-047	DF-503	CUB2S47	GEM-4147	6TM-S47			
C10	.4700					CY20C472K				(6)
C11	.1500					ED-1500				
C12	.6*		NP0-D166	DD-680	L1Q009	ED-68				
C13	.033	200	P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33			
C14	.033	200	P288N-033	DF-303	CUB6S33	GEM-4133	6TM-S33			
C15	1500					IRSD15	ED-1500			
C16	4700					IRSD47	CY20C472K			
C17	100000		BPD-01	DD-103	BYA8S1	ED-01	DC511	5HK-S1		
C18	.047	200	P288N-047	DF-503	CUB2S47	GEM-4147	6TM-S47			
C19	.1	200	P288N-1	DF-104	CUB2P1	GEM-201	6TM-P1			
C20	.200					IRSTB2	ED-820			
C21	.7		NP0-D14. T	TCZ-4RT	TCU947C	TCU-4.7	ZT-5547	5M-382		
C22	3300				LC103	CY20C332K		MS-274		
C23	.1	200	P288N-1	DF-104	CUB2P1	GEM-201	6TM-P1			
C24	100		NP0-D100	DD-101	L1Q101	ED-100	MCB235	MS-31		
C25	.1	600	P288N-1	DF-104	CUB4P1	GEM-601	6TM-P1			
C26	.1	600	P288N-1	DF-104	CUB6P1	GEM-601	6TM-P1			
C27	3300	1000								
C28	10000		BPD-01	DD-103	BYA8S1	ED-01	DCS11	5HK-S1		
C29	.1	600	P288N-1	DF-104	CUB6P1	GEM-601	6TM-P1			
C30	.047	600	P288N-047	DF-503	CUB6S47	GEM-8147	6TM-S47			
C31	15000		BPD-01	DD18-151	BYA01S15	ED-016	ZR-815			

① Some version many use 1500mmf in this application.

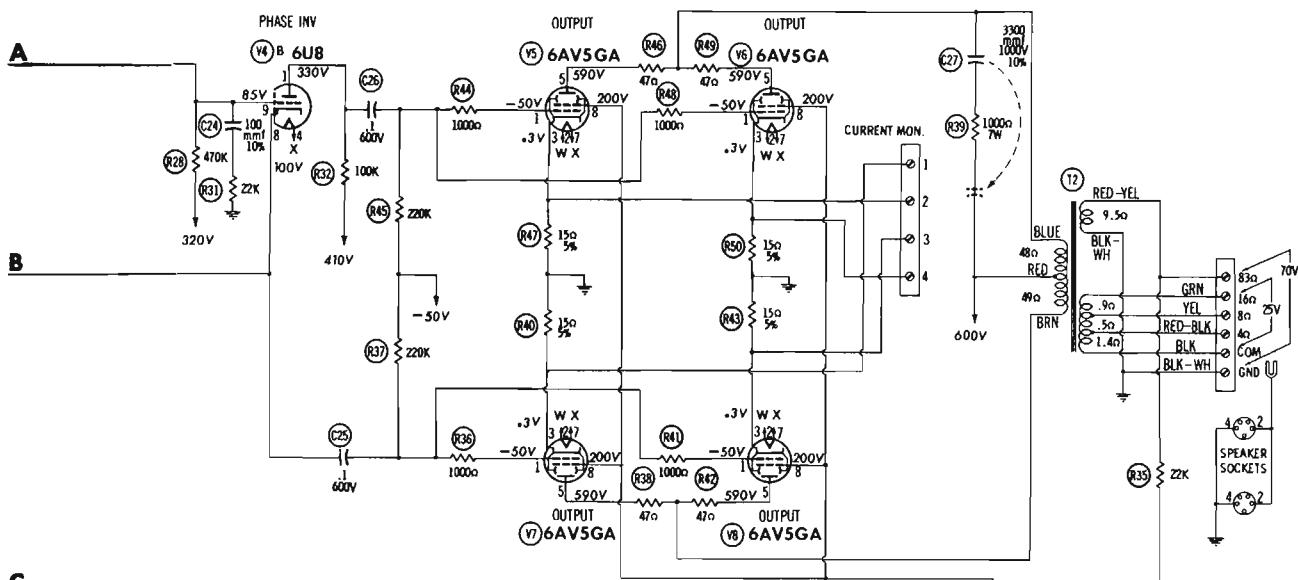
## **CHASSIS—TOP VIEW**





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

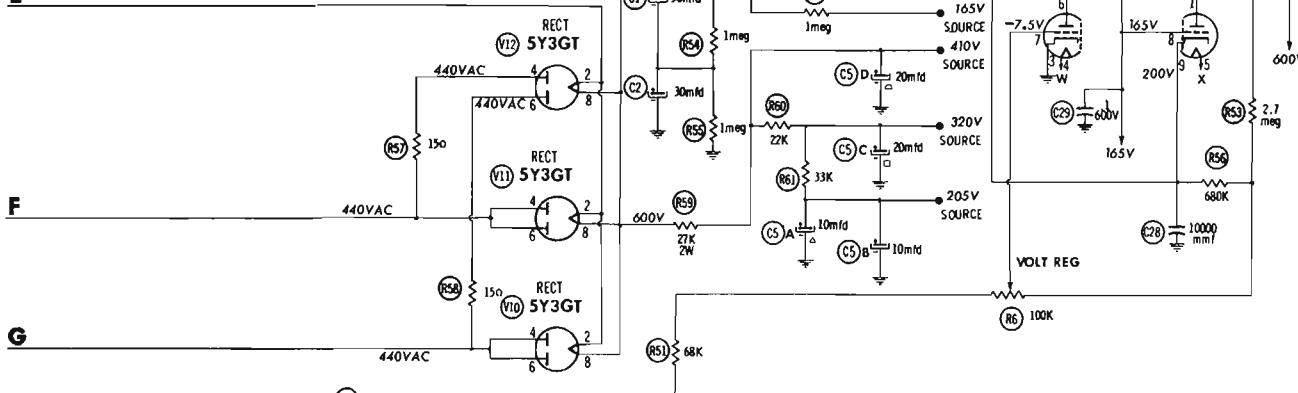
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of +15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.



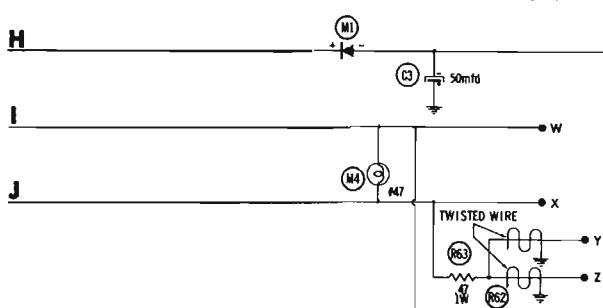
C

D

5



G



#### RESISTANCE READINGS

REVERSE BIASING CHARACTERISTICS										
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7// EC83	+180K	3.3meg	0Ω	.4Ω	.4Ω	+190K	.3meg	0Ω	.4Ω
V2	12AX7// EC83	+200K	3.3meg	0Ω	.4Ω	.4Ω	+200K	3.3meg	0Ω	.4Ω
V3	6AV6	110K	15000	.4Ω	.4Ω	NC	0Ω	+110K		
V4	6U8	+120K	500K	500K	.1Ω	.1Ω	+500K	390Ω	150K	+500K
V5	6AV5GA	400K	.1Ω	15Ω	NC	+95Ω	NC	.1Ω	+1meg	
V6	6AV5GA	400K	.1Ω	15Ω	NC	+95Ω	NC	.1Ω	+1meg	
V7	6AV5GA	400K	.1Ω	15Ω	NC	+96Ω	NC	.1Ω	+1meg	
V8	6AV5GA	400K	.1Ω	15Ω	NC	+96Ω	NC	.1Ω	+1meg	
V9	6CM7	1Ω	NC	0Ω	.1Ω	.1Ω	+1meg	320K	+1meg	+1meg
V10	5Y3GT	NC	20K(min)	NC	16Ω	NC	16Ω	NC	20K(min)	
V11	5Y3GT	NC	20K(min)	NC	32Ω	NC	32Ω	NC	20K(min)	
V12	5Y3GT	NC	20K(min)	TP	40n	NC	40Ω	TP	20K(min)	

† MEASURED FROM PIN 2 OF V12  
NC NO CONNECTION  
TP TIE POINT

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

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST- ANCE	WATTS	DAVID BOGEN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	1/2	V367	B-60	A47-500K-Z	Q13-133	U48	Input
	B Shunt			Not Req.	F5-3	Not Req.	Not Req.	
R2A	500K	1/2	V367	B-60	A47-500K-Z	Q13-133	U48	Mic 2
	B Shunt			Not Req.	F5-3	Not Req.	Not Req.	
R3A	500K	1/2	V367	B-60	A47-500K-Z	Q13-133	U48	Mic 3
	B Shunt			Not Req.	F5-3	Not Req.	Not Req.	
R4A	1.2meg	1/2	V407	B-60	A47-1.2meg-Z	Q13-133	U55	
				Not Req.	F5-3	Not Req.	Not Req.	
R5A	500K	1/2	V377	B-60	A47-500K-Z	Q13-133	U48	
	B Shunt			Not Req.	F5-3	Not Req.	Not Req.	
C	Switch			KB-1	SWE-12	76-1	US-26	Treble
R6A	100K	1/2	V392	BA-40*	A47-100K-S*	BU-128	TA15L	
	B Shunt			AK-1	FKS-1/4	TMI-KU	Not Req.	Volt Regulator

**\* Enlarge Mounting Hole to 3/8"**

## **RESISTORS**

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

**PARTS LIST AND DESCRIPTIONS (Continued)**  
**TRANSFORMER (POWER)**

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	DAVID BOGEN PART No.	Haldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	① 11V ③ LIA	870VCT ④ .052A	5V ⑤ 6A	8.3VCT ⑥ 7A	T3150					

#### **TRANSFORMER (AUDIO OUTPUT)**

ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES
		DAVID BOGEN PART No.	Hollardson PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Trad PART No.	
T2	330ΩAT CT (83Ω) BEC1 MO Tap③ 8Q, 4Q	T2124						

### **RECTIFIER**

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA				NOTES
		DAVID BOGEN PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.001A	B373	1263A	R8065	10	—

FUSE

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			DAVID BOGEN PART No.		INTERFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	3A 125V S/R			312005 (3AG 3A 125V S/R)	342001	MDX3	HKP

## MISCELLANEOUS

ITEM No.	PART NAME	DAVID BOGEN PART No.	NOTES
M3	Pilot Lamp		#47
M4	Pilot Lamp		#47
M5	Switch	S475	Selector (Slide Type DPDT)
M6	Switch	S381	Speech Filter (Slide Type SPDT)

#### **WIRING DATA**

General-use Unshielded Hook-up Wire .....	Use BELDEN No. 8530 (Solid) Available in Ten Colors
	..... 8532 (Stranded) Available in Ten Colors
Power Cord .....	Use BELDEN No. 1754-B (1 Ft. Length)
	..... 1752-K (7/8 Ft. Length)
Low-Loss Shielded Lead (Interconnecting) .....	Use BELDEN No. 6401
Phone Pick-up-Arm Cable .....	Use BELDEN No. 8430 (Two Conductor - Twisted)

# PHOTOFAC<sup>\*</sup> Folder



DAVID BOGEN  
MODEL PR100A



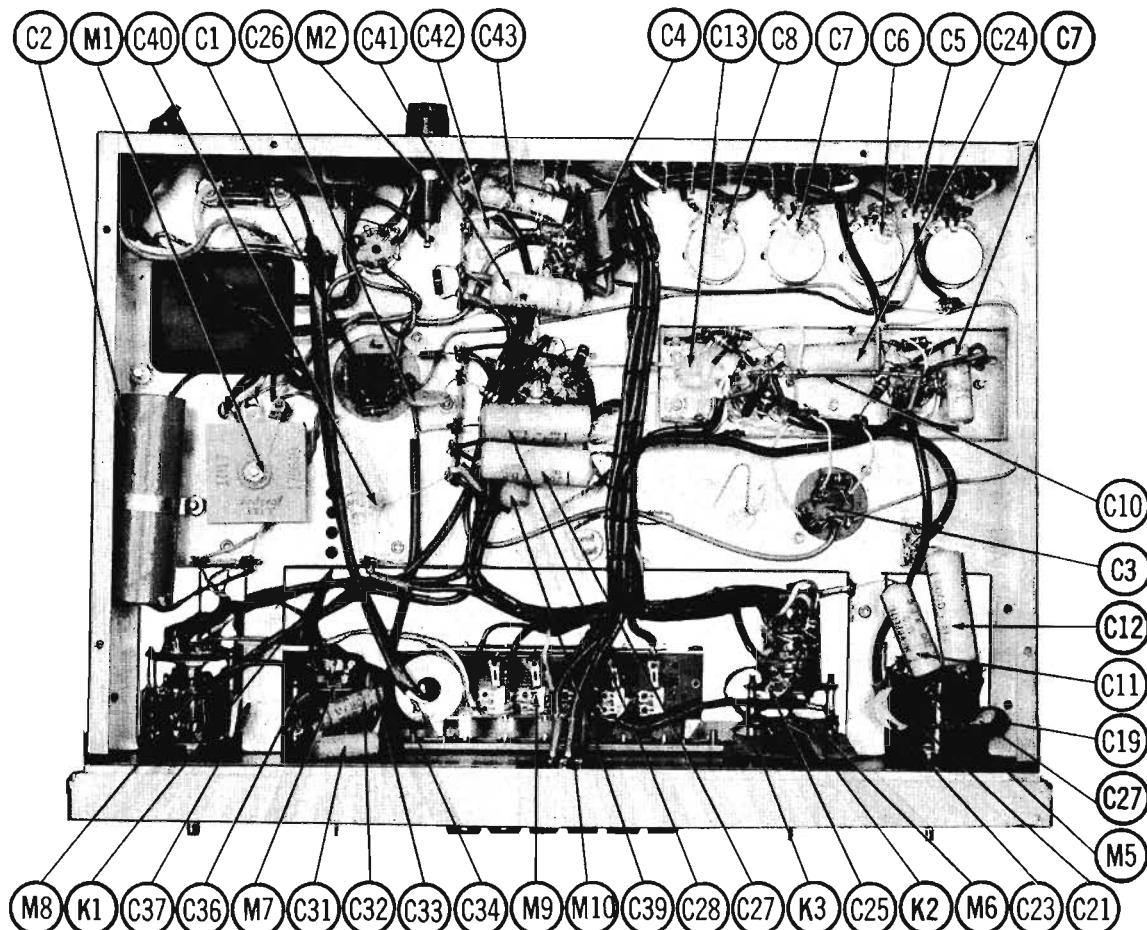
DAVID BOGEN  
MODEL PR100A

TRADE NAME	David Bogen Model PR100A		
MANUFACTURER	David Bogen Co., Inc., P. O. Box 500, Paramus, N. J.		
TYPE SET	AC Operated 8 Channel Equalizer Preamplifier		
TUBES (Five)	Types 12AU7/ECC82 Phono Preamplifier, 12AX7/ECC83 Phono AF Amplifier, 12AT7/ECC81 AF Amplifier, 12AU7/ECC82 AF Amp. - Cath. Follower, 6X4 Rectifier		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	.23 Amp. @ 117 Volts AC (23 Watts)

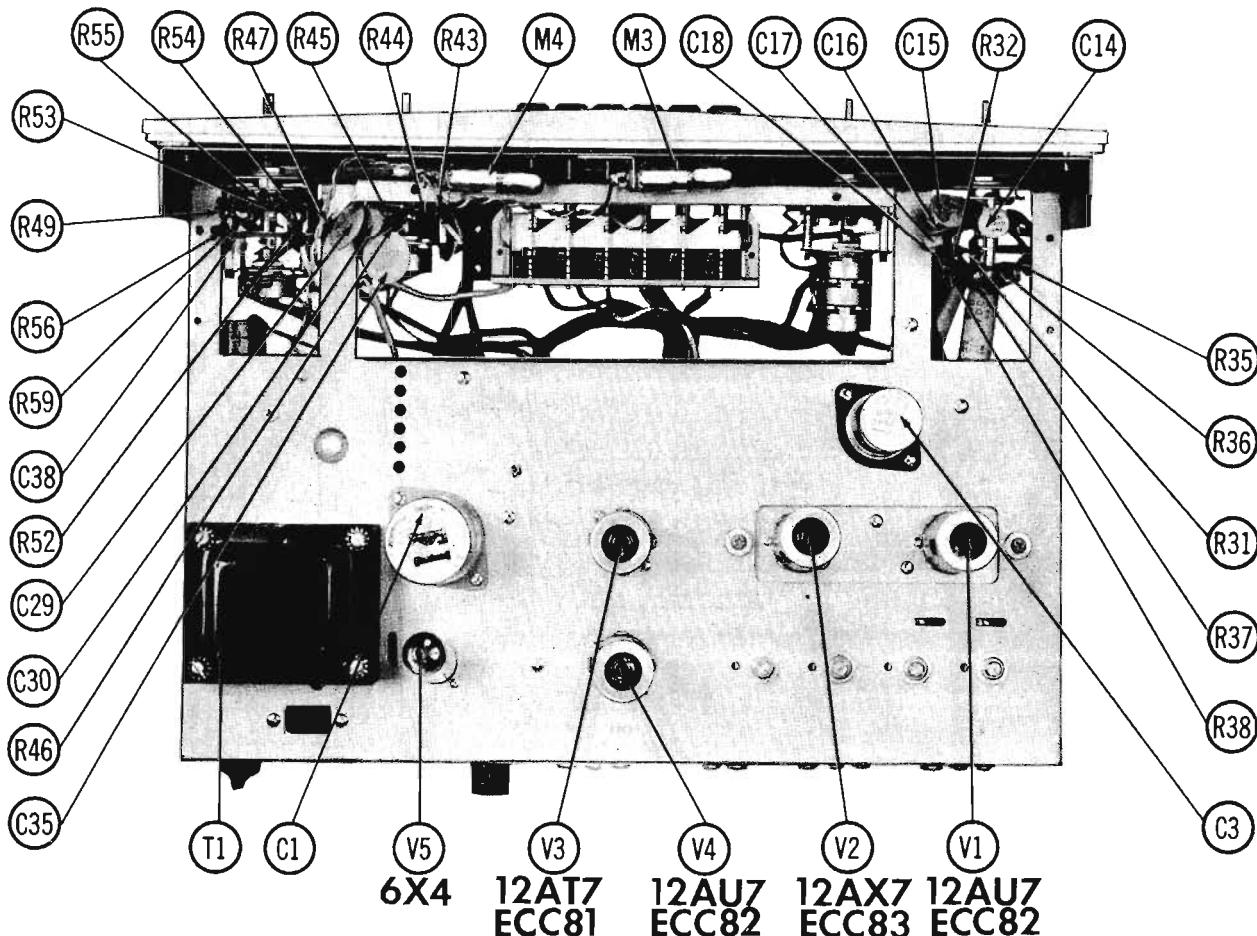
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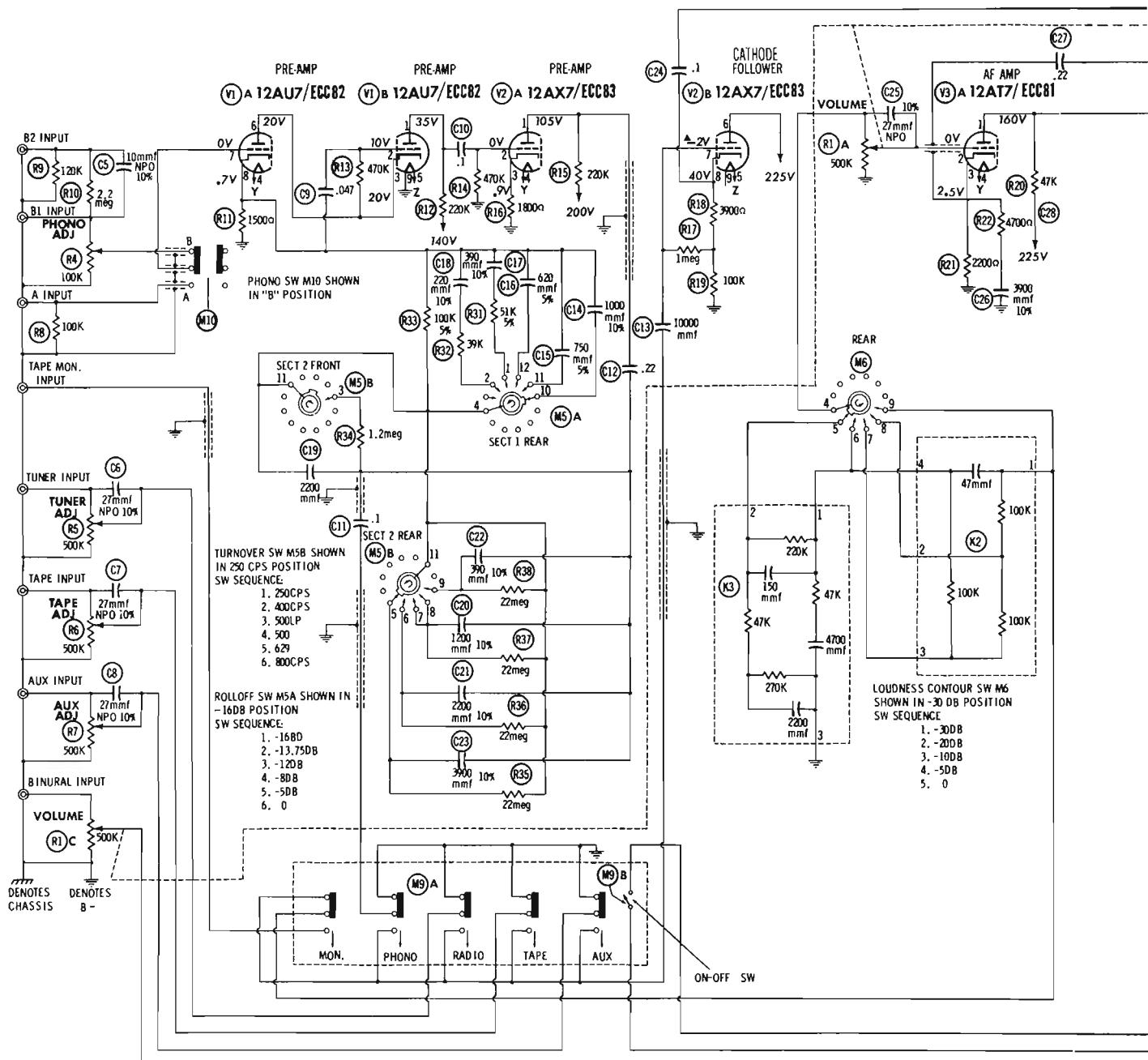
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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



CHASSIS TOP VIEW



#### RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AU7/ ECC82	† 370K	INF	INF	6Ω	6Ω	INF	100K	1500Ω	0Ω
V2	12AX7/ ECC83	† 250K	470K	1800Ω	6Ω	6Ω	† 30K	1.1Meg	100K	9Ω
V3	12AT7/ ECC81	† 77K	0Ω	2200Ω	6Ω	6Ω	† 130K	2.2Meg	1000Ω	9Ω
V4	12AU7/ ECC82	† 120K	600K	1000Ω	6Ω	6Ω	† 20K	1.1Meg	115K	9Ω
V5	6X4	1000Ω	NC	0Ω	.3Ω	NC	1000Ω	20K(Min)		

ALL MEASUREMENTS TAKEN IN "AUX" POSITION

† MEASURED FROM PIN 8 OF V4

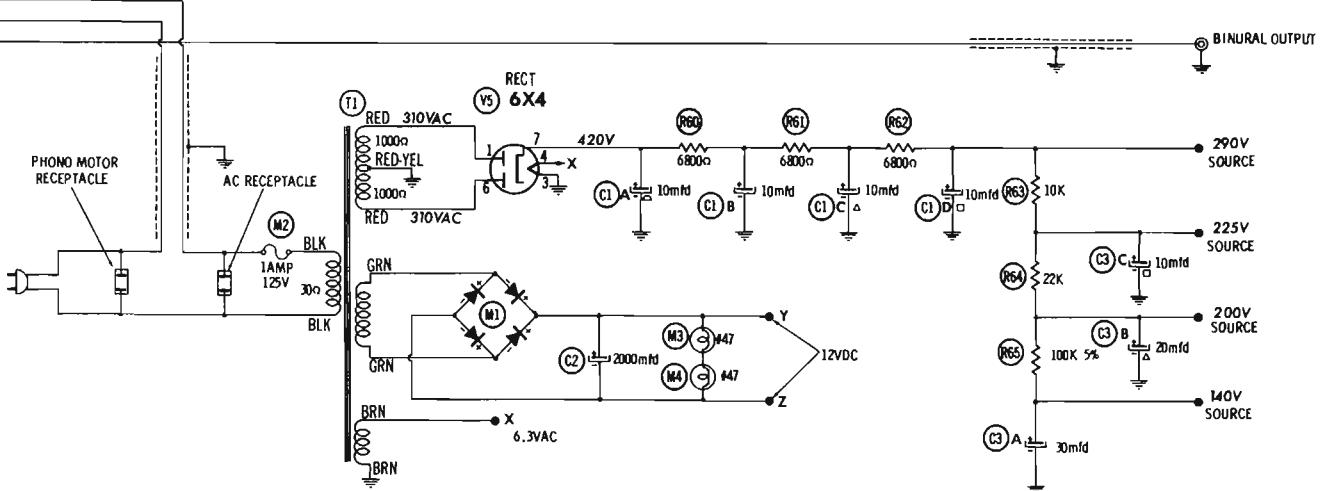
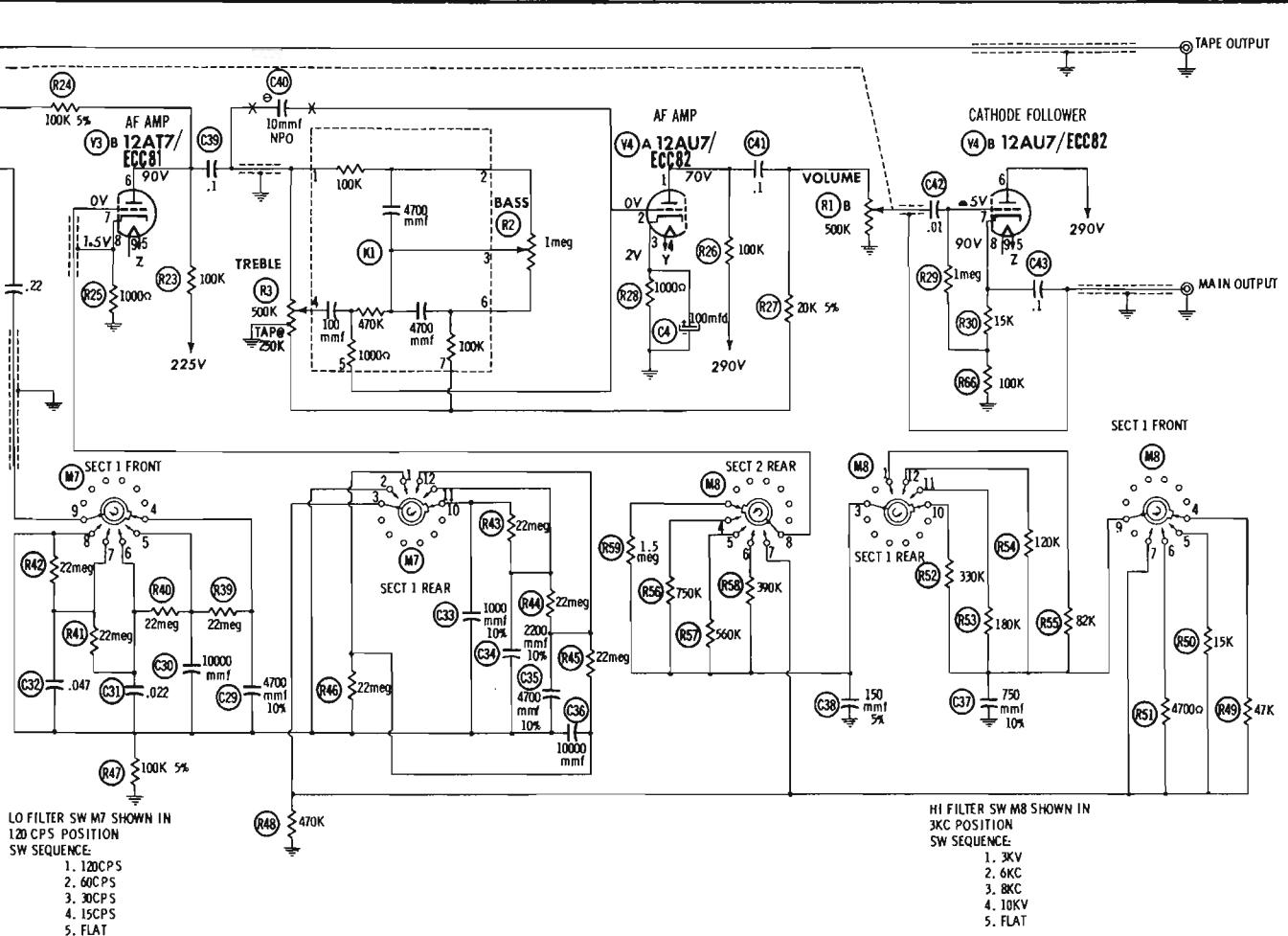
▲ MEASURED FROM PIN 8 OF V2

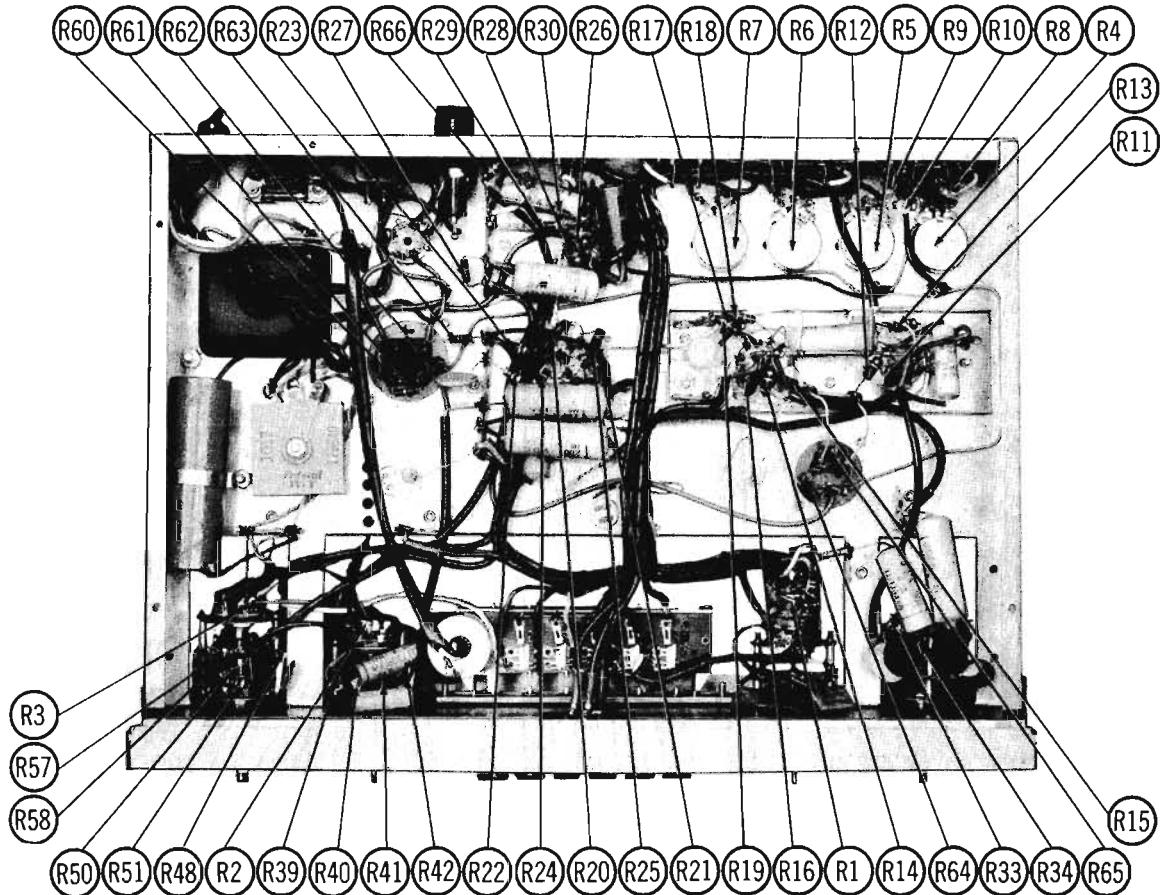
† MEASURED FROM PIN 7 OF V5

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 volt for voltage readings.
- Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
- All controls at minimum, proper output load connected.

SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION





CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

## **PARTS LIST AND DESCRIPTIONS**

### **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE
V1	Phono Preamplifier	12AU7/ECC82
V2	Phono AF Amplifier	12AX7/ECC83
V3	AF Amplifier	12AT7/ECC81

ITEM No.	USE	TYPE
V4	AF Amp. - Cath. Follower	12AU7/ECC82
V5	Rectifier	6X4

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA					
	CAP. VOLT.	DAVID BOGEN PART No.	AEROVOX PART No.	CORNELL- DUDLEY PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CIA	10 450		AF214-10	D0090	FP434	TMQ-10	Q-030	TVL-4780
B	10 450							
C	10 450							
D	10 450							
C2	2000 15		AFX1-03	BR20001	TC1501 TC1501 FP230.3 TC47	TD-1000-15 TD-1000-15 D335 MT-1530	S-025	R2425*
C3A	30 150		AFH3-17					
B	20 200							
C	10 250							
C4	10 6		PRS6V100	BBR100-6	TC2501	TD-100-6	MTH-0610	TVB-1101

• 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	DAVID BOGEN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBLIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C5	10		NPO-SI 10	TC-10	C1001C	TCO-10	ZT-541	5TCC-Q1	NPO 10%	
C6	27			TCZ-27	C10027C	TCO-27			NPO 10%	
C7	27			TCZ-27	C10027C	TCO-27			NPO 10%	
C8	27			TCZ-27	C10027C	TCO-27			NPO 10%	
C9	.047 200	P288N-047		DF-503	CUB2S47		GEM-4147	2TM-S47		
C10	.1 200	P288N-1		DF-104	CUB2P2I		GEM-201	2TM-P1		
C11	.1 200	P288N-1		DF-104	CUB2P2I		GEM-201	2TM-P1		
C12	.22 200	P288N-22			CUB2P22		CUB2P22	2TM-P22		
C13	10000	BPD-01		DD-103	BYA6SI	ED-01	DC51U	5HK-SI		
C14	1000					ED-1000				
C15	720								10%	
C16	620								5%	
C17	390								5%	
C18	220								10%	
C19	2200								10%	
C20	1200								10%	
C21	2200								10%	
C22	330								10%	
C23	3900								10%	
C24	.1 200	P288N-1		DF-104	CUB2P2I	ED-390	GEM-201	2TM-P1		
C25	.27			TCZ-27	C10027C	ED-220				
C26	3900					ED-1200	UC-5222	5GA-D22		
C27	.22 200	P288N-22		DD-222	BYA10D22					
C28	.22 200	P288N-22								
C29	4700									
C30	10000									
C31	.022 200	P288N-022		DD-203	CUB4S22	ED-02	GEM-4122	2TM-S22		
C32	.047 200	P288N-047		DF-503	CUB2S47		GEM-4147	2TM-S47		
C33	1000						ED-1000			
C34	2200								10%	
C35	4700								10%	
C36	10000	BPD-01		DD-103	BYA6SI	ED-01	DC51U	5HK-SI		
C37	750									
C38	.15 200	NPO-SI 150		TCZ-150		ED-750			10%	
C39	.15 200	P288N-1		DF-104	CUB2P2I	TCO-150	ZT-5S15	5TCC-T15		
C40	.10	P288N-10		TC-10	C1001C	TCO-10	ZT-541	2TM-P1		
C41	.1 400	P488N-1		DF-104	CUB4P1		GEM-041	4TM-P1		
C42	.01 200	P288N-01		DD-103	CUB4S1	GP-10000	GEM-0411	4TM-SL		
C43	.1 200	P288N-1		DF-104	CUB2P2I		GEM-201	2TM-P1		

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

### **CONTROLS**

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST- ANCE	WATTS	DAVID BOGEN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	1/2	S452B			Q1-133		Volume
D	500K	1/2				M13-133		Volume
C	500K	1/2				M13-133		Volume
R2A	1Meg	1/2	B-59	A47-1Mag-S		Q1-137	U54	Bass
B	Shalt	1/2	Not Req.	F1K5 1/2		Not Req.	Not Req.	
RA	500K	1/2	BT-85	A47F5-500K	Q19-13X	UT-43L		Treble, Tap @ 250K
B	Shalt	1/2	Not Req.	F1K5 1/2	Not Req.	Not Req.	Not Req.	
R4	100K	1/2	AB-40	A47-100K-S	Q1-126	U41		Phono AdjusL
B	Shalt	1/2	AK-1	F1K5 1/4	RQ	Not Req.		
R6	500K	1/2	V275B	A47-500K-Z	Q19-133	U48		Tuner AdjusL
R4	500K	1/2	AB-40	A47-500K-Z	Q13-133	U48		
R6	500K	1/2	AK-1	F1K5 1/4	RQ	Not Req.		
RTA	500K	1/2	V275B	AB-60	A47-500K-Z	Q13-133	U48	Tape AdjusL
B	Shalt	1/2	AK-1	F1K5 1/4	RQ	Not Req.		

## **RESISTORS**

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

## **TRANSFORMER (POWER)**

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	David Bogen PART No.	Haldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
TI	117VAC (@ .23A)	840VCT (@ .23A)	6.3VAC (@ .8A)	12VAC (@ .125A)	T3133-1					

**PARTS LIST AND DESCRIPTIONS (Continued)**  
**COMPONENT COMBINATIONS**

ITEM No.	USE	DESCRIPTION	David Bogen PART No.	REPLACEMENT DATA
K1	Tone Compensation	4700MMF, 4700MMF, 100MMF 100K, 470K, 1000K, 100K	C392	Centralab PC190
K2	Tone Compensation	47MMF, 100K, 100K, 100K	C410	Sprague 104C-11
K3	Tone Compensation	150MMF, 4700MMF, 2200MMF 47K, 47K, 270K, 220K	C420	Sprague 102C-22

**SELENIUM RECTIFIER**

ITEM No.	RATING (Measured)	REPLACEMENT DATA				NOTES
		David Bogen PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.720A	R-432	1017	C1B	604B	

**FUSES**

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			David Bogen PART No.		LITTLEFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	1A 125V Slo-Blo			31300L (3AG 1A 125V S/B)	34200I	MDL1	HKP

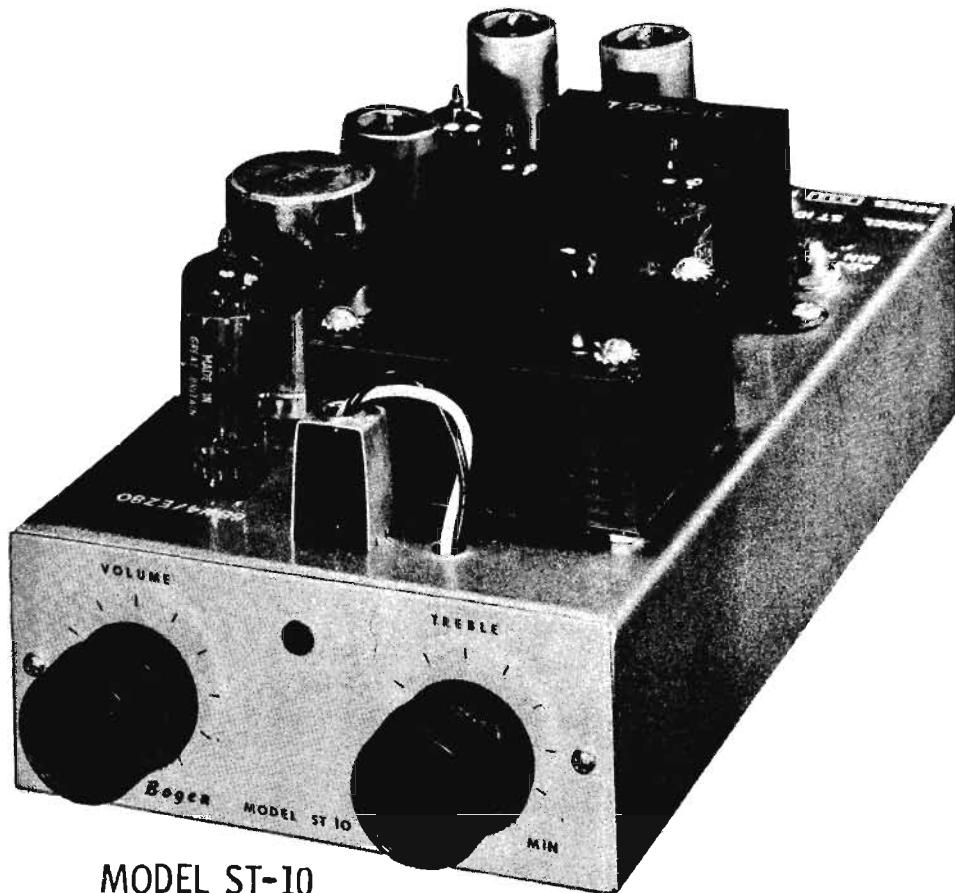
**MISCELLANEOUS**

ITEM No.	PART NAME	David Bogen PART No.	NOTES
M3	Pilot Lamp		#47
M4	Pilot Lamp		#47
M5A	Switch		Rotoloft (Rotary Wafer Type)
B	Switch	8422A	Turnover (Rotary Wafer Type)
M6	Switch		Contour (Rotary Wafer Type)
M7	Switch	8424C	Lo Filter (Rotary Wafer Type)
M8	Switch	8425C	Hi Filter (Rotary Wafer Type)
M9A	Switch	8426E	Input Selector Assy (Pushbutton Slide Type)
B	Switch		On-Off (Pushbutton Slide Type)
M10	Switch	8476	Phone (A & B) (Slide Type SPST)

# PHOTOFAC<sup>\*</sup> Folder



DAVID BOGEN  
MODELS ST-10, ST-10G



MODEL ST-10

DAVID BOGEN  
MODELS ST-10, ST-10G

TRADE NAME	David Bogen Models ST-10, ST-10G		
MANUFACTURER	David Bogen Co., Inc., P. O. Box 500, Paramus, N. J.		
TYPE SET	AC Operated Audio Amplifier		
TUBES (Seven)	Types ECC83/12AX7 (or) 12AD7 Ch. 2 Preamplifier, 6C4 Ch. 2 Cathode Follower, ECC83/12AX7 (or) 12AD7 Ch. 1 Preamplifier, 6U8 Ch. 1 AF Amp. - Phase Inv., (2) 6AQ5 Ch. 1 Output, EZ80/6V4 (or) EZ81/6BW4 Rectifier		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	.52 Amp. @ 117 Volts AC (52 Watts)

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Ch. 2 Preamplifier	ECC83/12AX7	
V2	Ch. 2 Cathode Follower	6C4	Note 1
V3	Ch. 1 Preamplifier	ECC83/12AX7	Note 1

Note 1. Type 12AX7 may be used in some versions.

Note 2. Type E281/6BW4 may be used in some versions.

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.30	350		AFH4-49	CUD080				
B	.30	350			BR3035				
C	.35	350							
D	10	250							
C2	6	250	①	PBS250V6	BBR6-250	TC51	TD-6-250	MT-2508	TVA-1503

① Some versions may use 20MFD in this application.

### 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						
	CAP.	VOLT.	David Bogen PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.
C3	.022	200		P288N-022	DD-203	CUD4822	ED-02	GEM-4122	2TM-S22
C4	.022	200		P288N-022	DD-203	CUD4822	ED-02	GEM-4122	2TM-S22
C5	.033	200		BPD-00027	DD-203	CUD4822	ED-270	UC-5127	2TM-S27
C6	.033	200		P288N-022	DF-303	CUD4833	ED-02	GEM-4133	2TM-S33
C7	1	200		P288N-022	DF-303	CUD4833	ED-02	GEM-201	2TM-P1
C8	.022	200		P288N-022	DD-203	CUD4822	ED-02	GEM-4122	2TM-S22
C9	.022	200		P288N-022	DD-203	CUD4822	ED-02	GEM-4122	2TM-S22
C10	2.70			BPD-00027	DD-271	L10T27	ED-270	UC-5227	SGA-T27
C11	.033	200		P288N-033	DF-303	CUD6833	ED-02	GEM-4133	2TM-S33
C12	.022	200		P288N-022	DD-222	CUD8D22	GP-2200	GEM-0222	2TM-S22
C13	.033	200		BPD-00027	DD-203	CUD4833	ED-02	GEM-4133	2TM-S33
C14	.022	400		P488N-032	DD-203	CUD4833	ED-02	GEM-4122	2TM-S22
C15	.880			BPD-00098	DD-681	BYA10T68	ED-680	UC-5388	SGA-T68
C16				BPD-00098	DD-680	1LJDQ88	ED-680	UC-5468	SGA-Q68
C17	15000			BPD-00088	DD16-153	BYA10S15	ED-015		SHK-S15
C18	15000			BPD-0016	DD16-153	BYA10S15	ED-015		SHK-S15
C19				BPD-0016	DD-102	BYA8D1	ED-1000	DC521	SHK-D1

① Some versions may use .033MFD in this application.

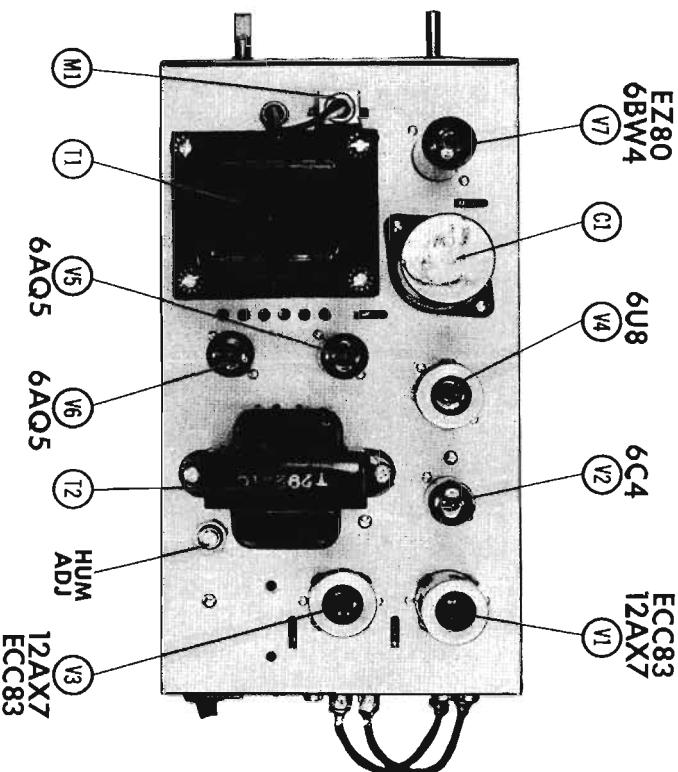
② Some versions may use 27MFMF in this application.

③ Not used in some versions.

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					
	RESISTANCE	WATTS	David Bogen PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	600K		V411A	BB-104	AD47-500K-2	Q13-133	UB1402	Volume
B	500K			BB-104	AD47-500K-2	M13-133	Not Req.	Volume
C	500K		V323A	BB-104	AD47-500K-2	F5-3	Not Req.	Treble
R2A	500K			BB-104	AD47-500K-2	F5-3	Not Req.	
B	Shaft			BB-104	AD47-500K-2	BB-12	Not Req.	
C	Switch			BB-104	AD47-500K-2	BB-12	Not Req.	
D	Cover			BB-104	AD47-500K-2	BB-12	Not Req.	
R3A	500	2	V113A	BB-104	AD47-500K-2	BB-12	Not Req.	Hum Balance (Wire Wound)
B	Shaft			BB-104	AD47-500K-2	BB-12	Not Req.	

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	REPLACEMENT DATA		NOTES
	David Bogen PART No.	IRC PART No.	
R4	100K	BTS-100K	
R5	3.3Meg	BTS-3.3Meg	
R6	220K	BTS-220K	
R7	180K	BTS-180K	
R8	3.3Meg	BTS-3.3Meg	
R9	220K	BTS-220K	
R10	47K	BTS-47K	
R11	100K	BTS-100K	
R12	3.3Meg	BTS-3.3Meg	
R13	220K	BTS-220K	
R14	180K	BTS-180K	
R15	3.3Meg	BTS-3.3Meg	
R16	220K	BTS-220K	
R17	150K	BTS-150K	Note 1
R18	47K	BTS-47K	
R19	70K	BTS-70K	

- Note 1. Some versions may use 100K in this application.
- Note 2. Some versions may use 22K in this application.
- Note 3. Some versions may use 10K in this application.
- Note 4. Some versions may use 33K in this application.
- Note 5. Some versions may use 92K in this application.
- Note 6. Not used in some versions.

## TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	David Bogen PART No.	Hollidson PART No.	Merit PART No.	Sioncor PART No.	Thorderson PART No.	Triad PART No.
T1	117VAC ② .52A	580VCT ② .068A	8.3VAC ② 2A		T3174 ①				22R02 ②	R-5B

① Alternate Part #T3159

② Tape 5V ③ 2A winding and center tap on 8.3V winding.

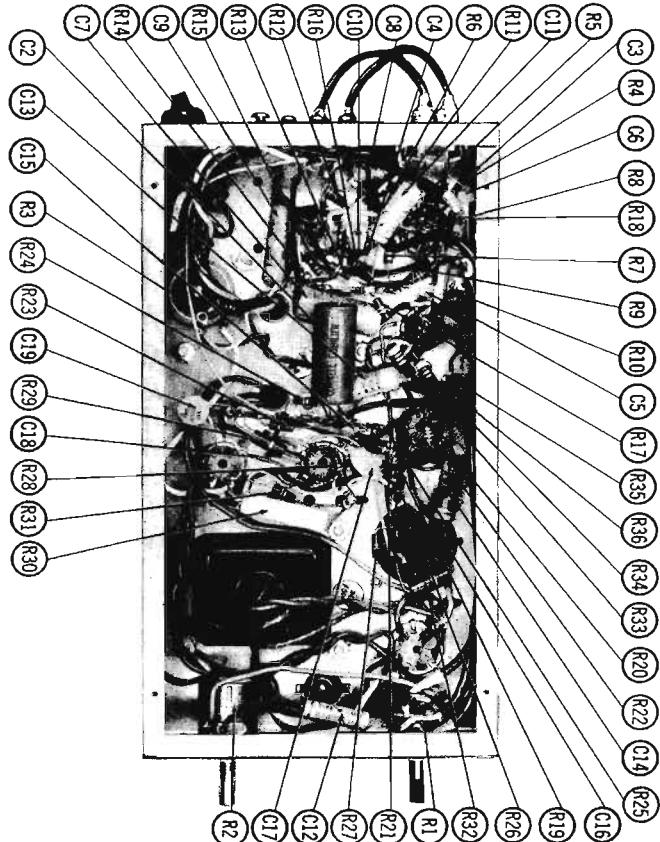
## TRANSFORMER (AUDIO OUTPUT)

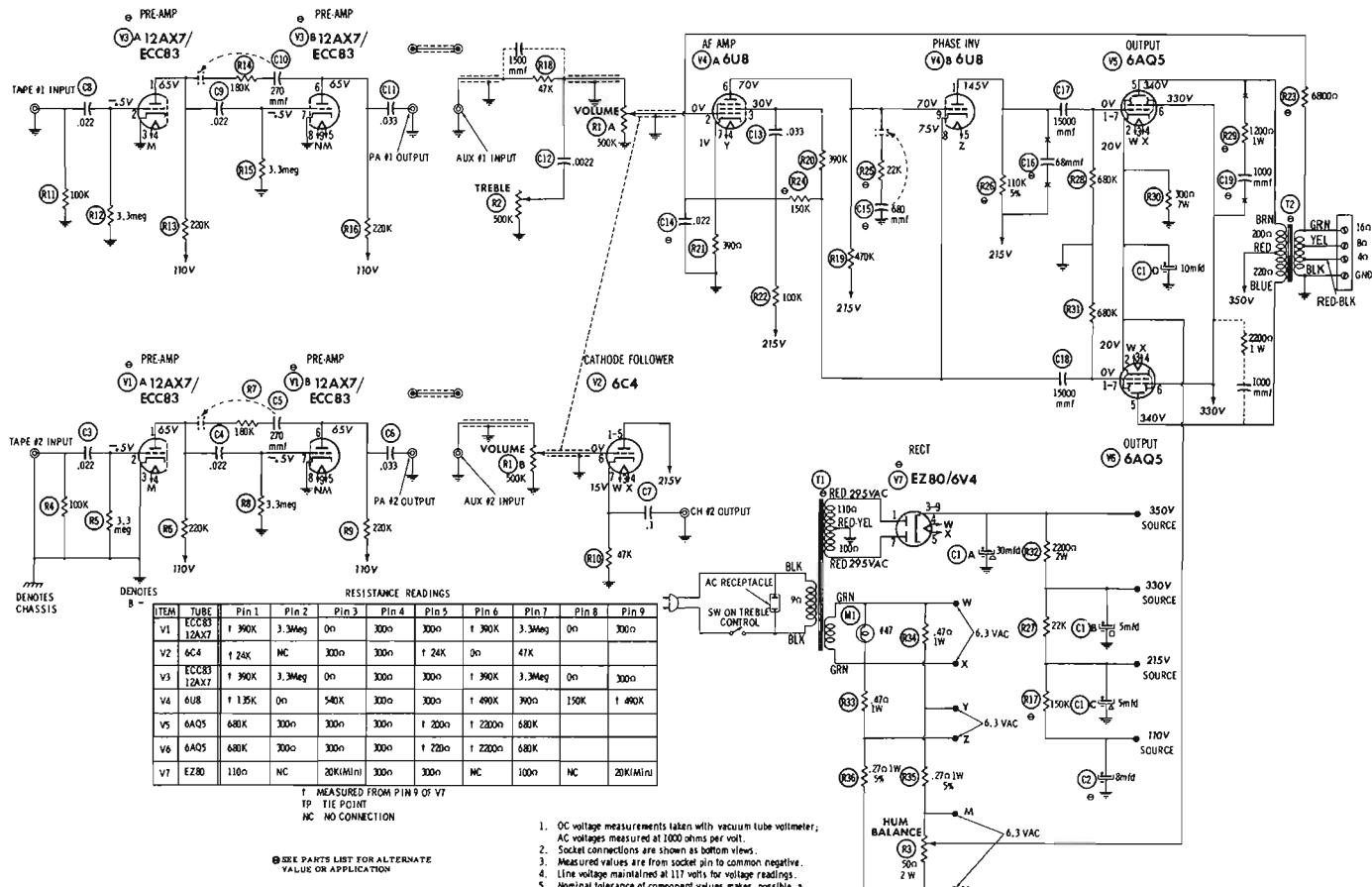
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	David Bogen PART No.	Hollidson PART No.	Merit PART No.	Sioncor PART No.	Thorderson PART No.	
T2	7800Ω CT Tap④ 8Ω, 4Ω	16Ω	T292-1	Z1112	A-3027			④ Alternate Part Number ⑤ Drill new mounting hole
	3600Ω CT Tap④ 8Ω, 4Ω	16Ω	T282-3 ①	21404 ②	A-3870	26S59		

## MISCELLANEOUS

ITEM No.	PART NAME	David Bogen PART No.	NOTES
ML	Pilot Light		#47

## CHASSIS—BOTTOM VIEW

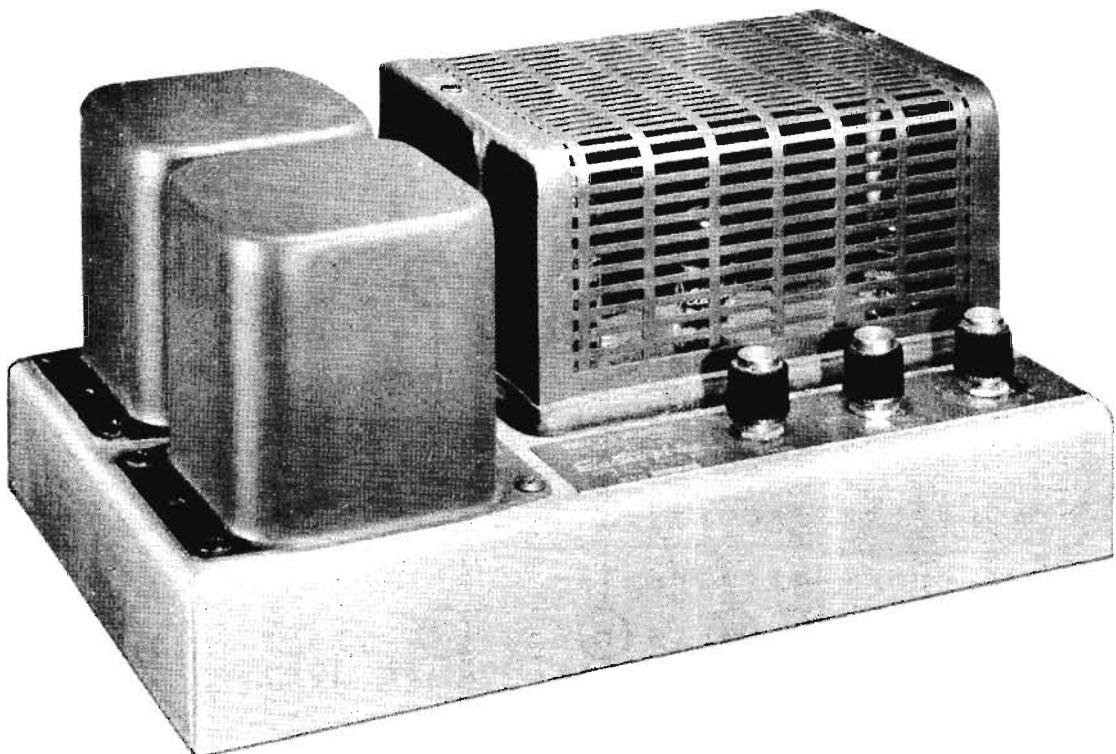




† MEASURED FROM PIN 9 OF VT  
TP TIE POINT  
NC NO CONNECTION

**SEE PARTS LIST FOR ALTERNATE  
VALVE OR APPLICATION**

1. OC voltage measurements taken with vacuum tube voltmeter; AC voltage 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 of component values makes possible a variation of  $\pm 1\%$  in voltage and resistance readings.
  6. All controls at minimum, proper output load connected.



ELECTRO-VOICE  
MODEL A15

TRADE NAME	Electro-Voice Model A15	
MANUFACTURER	Electro-Voice, Inc., Buchanan, Mich.	
TYPE SET	AC Operated Amplifier	
TUBES (Six)	Types 12AX7 AF Amp.-Phase Inv., 12BR7A Driver, (2) EL84 Output, (2) 6X4 Rectifier	
POWER SUPPLY	105-125 Volts AC-60 Cycles	RATING .48 Amp. @ 117 Volts AC

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

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## **PARTS LIST AND DESCRIPTIONS**

### **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES
V1	AF Amp.-Phase Inv.	12AX7	
V2	Driver	12BH7A	
V3	Output	EL84	

ITEM No.	USE	TYPE	NOTES
V4	Output	EL84	
V5	Rectifier	6X4	
V6	Rectifier	6X4	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	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	+40	400	4208	AFH2-57	B0450	FP238	TMD-43	D-185	TVL-2764
B	+40	400							
C2A	+40	400	4208	AFH2-57	B0450	FP238	TMD-43	D-185	TVL-2764
B	+40	400							
C3	20	400	4207	AFH1-45	A0480	FP144	TM3-50	S-280	TVL-1660
C	50	100	4242	PRG150V50	B15015	TC49	TD-50-150	FM-1550	TVV-1414

## 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
		ELECTRO-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL- DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C5	.1	200	4265	PFD88N-L	DFD-104	CUB4P1		PT401	27M-P1	
C6	.100		4281	BPD-0001	DD-101	G042	831-101	UC-531	5GA-T1	
C7	.022	400	4260	BPD-02	DD-203	CUB4S22	817-02	PT412	4TM-S22	
C8	.047	400	4243	BPD-05	DF-503	CUB4S7		PT417	4TM-S47	
C9	.047	400	4243	BPD-05	DF-503	CUB4S7		PT417	4TM-S47	
C10	10000		4257	BFD-01	DF-102	CUB4P1	611-01	DC-511	5EK-T1	
C11	.1	600	4241	PDE88N-L	DF-104	CUB4P1		PT401	27M-P1	
C12	.1	600	4241	PDE88N-L	DF-104	CUB4P1		PT801	6TM-P1	
C13	.047	400	4243	BPD-05	DF-503	CUB4S7		PT417	4TM-S47	
C14	.047	400	4243	BPD-05	DF-503	CUB4S7		PT417	4TM-S47	

## **CONTROLS**

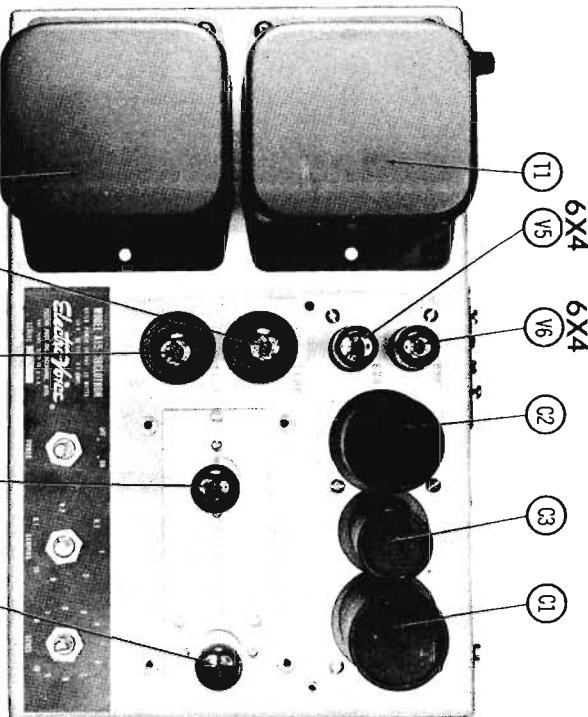
ITEM No.	REPLACEMENT DATA						INSTALLATION NOTES
	RATING RESIST- ANCE	WATTS	ELECTRO-VOICE PART NO.	CENTRALIA PART NO.	CLAROSTAT PART NO.	IRC PART NO.	
R1A B	250W B	1	J4686 Not Req.	B-51 Not Req.	A47-250K-Z PS-3	Q13-130 Not Req.	U44 Not Req.
R2A B	10 1800Q	2	K4686				

## **RESISTORS**

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

ITEM No.	REPLACEMENT DATA				ITEM No.	REPLACEMENT DATA				ITEM No.
	Electro-Voice PART No.		IRC PART No.	NOTES		Electro-Voice PART No.		IRC PART No.	NOTES	
	OHMS	WATT				OHMS	WATT			
R3	270K	4669	BTS-270K		R14	120Ω	4658	BTS-1200		
R4	22K	4651	BTS-22K		R15	120Ω	4607	BTS-120		
R5	1. 2M <sup>2</sup>	4658	BTS-1.2M <sup>2</sup>		R16	470K	4650	BTS-470K		
R6	27K	4651	BTS-27K		R17	470K	4650	BTS-470K		
R7	470Ω	4654	BTS-470		R18	470Ω	4607	BTS-470Ω		
R8	27K	4651	BTS-27K		R19	47K	4668	BTS-47K		
R9	470K	4650	BTS-470K		R20	1800Ω		BTS-1800		
R10	470K	4650	BTS-470K		R21	58K	4652	BTS-58K		
R11	470K	4650	BTS-470K		R22	58K	4652	BTS-58K		
R12	12K	2	4679	BTS-12K	R23	100Ω	2	4655	BTS-100	
R13	12K	2	4679	BTS-12K	R24	100Ω	2	4655	BTS-100	

## **CHASSIS—TOP VIEW**



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Electro-Voice PART No.	Holddorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	117VAC ① .45A	550VCT ① .024A	550VCT ① .026A	6.3TAC ① .5A	1591					
				SEC. 4 20V *						

\* Bias Supply.

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	Electro-Voice PART No.	Holddorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.		
T2	3000Ω ② 16Ω imp. ② 8Ω, 4Ω	1590						

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Electro-Voice PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	SAG 8/B	1 1/2A 125V	20171		31301.5 (SAG 8/B 1 1/2A)	\$42001	MDX 1 1/2	EDCP

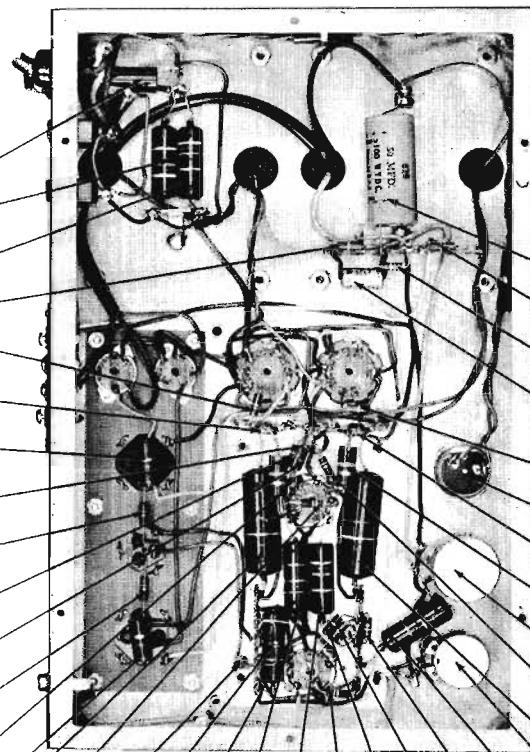
### SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA					NOTES
	CURRENT	Electro-Voice PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES AZIZIAN PART No.	
M2		5014	1159	CR10	8820		10	

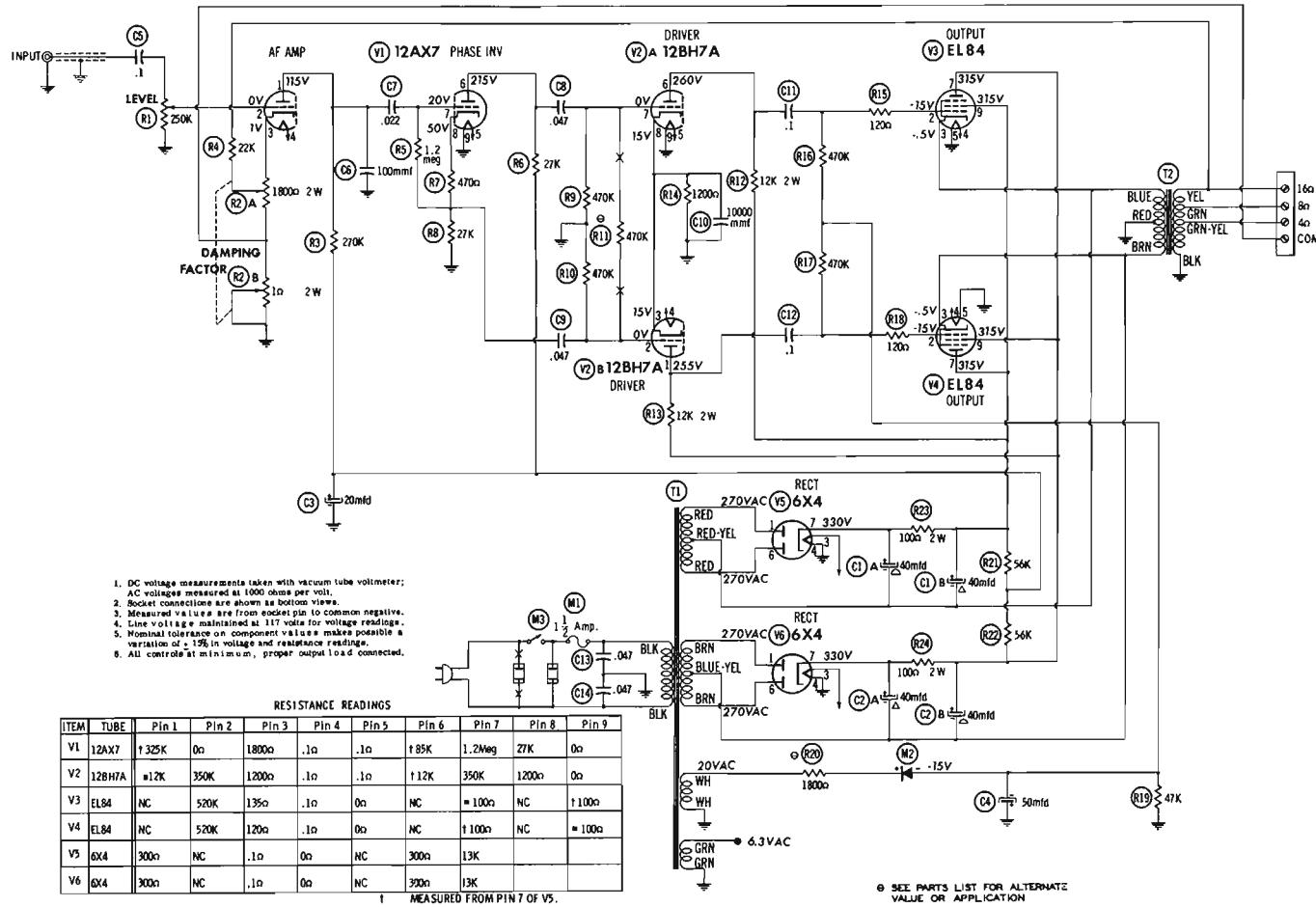
### MISCELLANEOUS

ITEM No.	PART NAME	Electro-Voice PART No.	NOTES
M3	Switch	B5641	On-off (Power) SPST

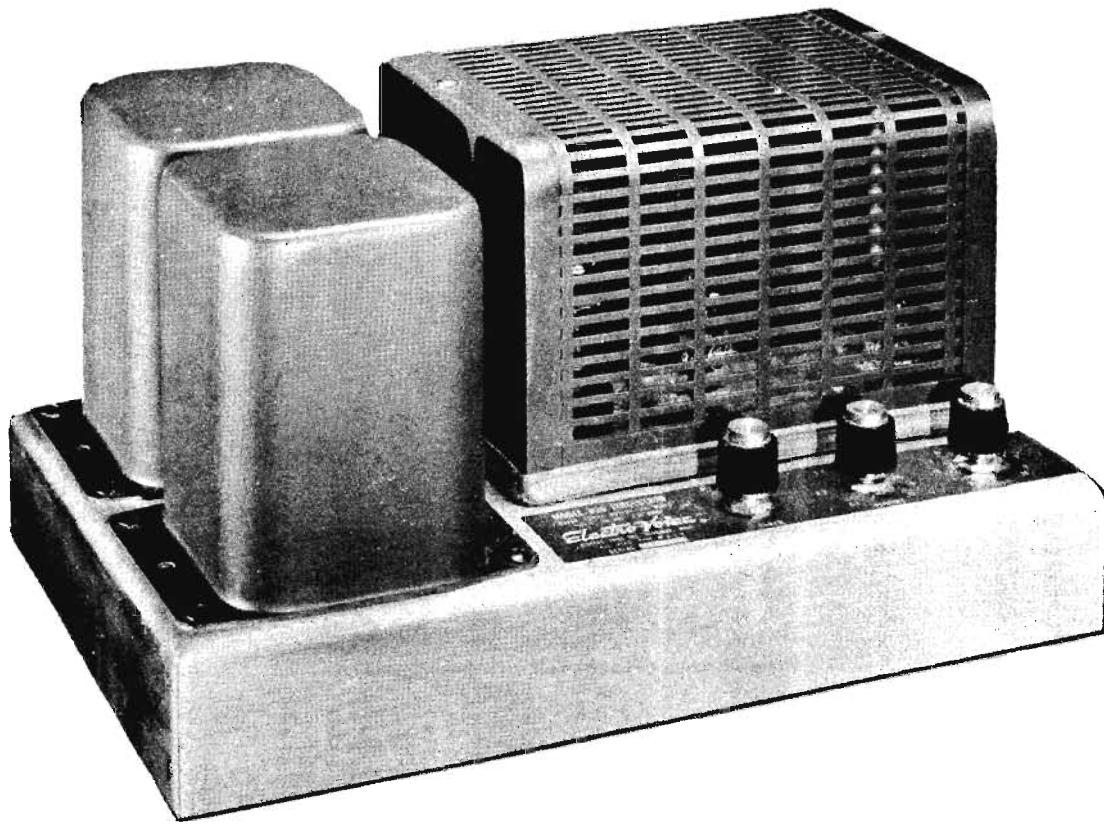
## CHASSIS—BOTTOM VIEW



C4  
R4  
R19  
M2  
R15  
M3  
R16  
R13  
R2  
R9  
C12  
R1



A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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ELECTRO-VOICE  
MODEL A20

TRADE NAME	Electro-Voice Model A20
MANUFACTURER	Electro-Voice, Inc., Buchanan, Mich.
TYPE SET	AC Operated 20 Watt Amplifier
TUBES (Six)	Types 12AX7 AF Amplifier-Phase Inverter, 12BH7A Driver, (2) 6V6GT Output, (2) 6X4 Rectifier
POWER SUPPLY	105-125 Volts AC - 60 Cycles
	FATING .59 Amp. @ 117 Volts AC

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## **PARTS LIST AND DESCRIPTIONS**

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp.-Phase Inv.	12AX7	
V2	Driver	12BH7A	
V3	Output	6VRC7	

ITEM No.	USE	TYPE	NOTES
V4	Output	6V6GT	
V5	Rectifier	6X4	
V6	Rectifier	6X4	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	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.
CIA	40	500	4247	AFH2-72	B053	FP288	TMD-62	D-275	R1495 *
B	40	500							
C2A	40	500	4247	AFH2-72	B053	FP288	TMD-62	D-275	R1495 *
B	40	500							
CS3	20	450	4246	AFH2-50	A046	FP144	TMB-55	S-260	TVL-1714
CS4	50	100	4242	PR5150V50	BRS015	TC49	TD-50-150	FM-1550	TYA-1414

\* 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 DEVICE							NOTES
	CAP. μF	VOLT	Electro-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL- DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	.1	200	4285	P288N-1	DF-104	C192P1		PT401		2T4-P1
C6	.100		4281	BPD-0001	DD-103	G045	811-101	UC-51C	5C4-T1	
C7	.032	400	4260	BPD-02	DD-203	C194B2	817-02	PT412	4TM-922	
C8	.047	400	4243	BPD-05	DF-503	C194B47		PT4147	4TM-S47	
C9	.047	400	4243	BPD-05	DF-503	C194B47		PT4147	4TM-S47	
C10	10000		4257	BPD-01	DD-103	K082	811-01	DC-511	5EH-S1	
C11	.1	600	4241	P88N-1	DF-104	C196P1		PT801	8TM-P1	
C12	.1	600	4241	P88N-1	DF-104	C196P1		PT801	8TM-P1	
C13	.047	400	4243	BPD-05	DF-503	C194B47		PT4147	4TM-S47	
C14	.047	400	4243	BPD-05	DF-503	C194B47		PT4147	4TM-S47	

## **CONTROLS**

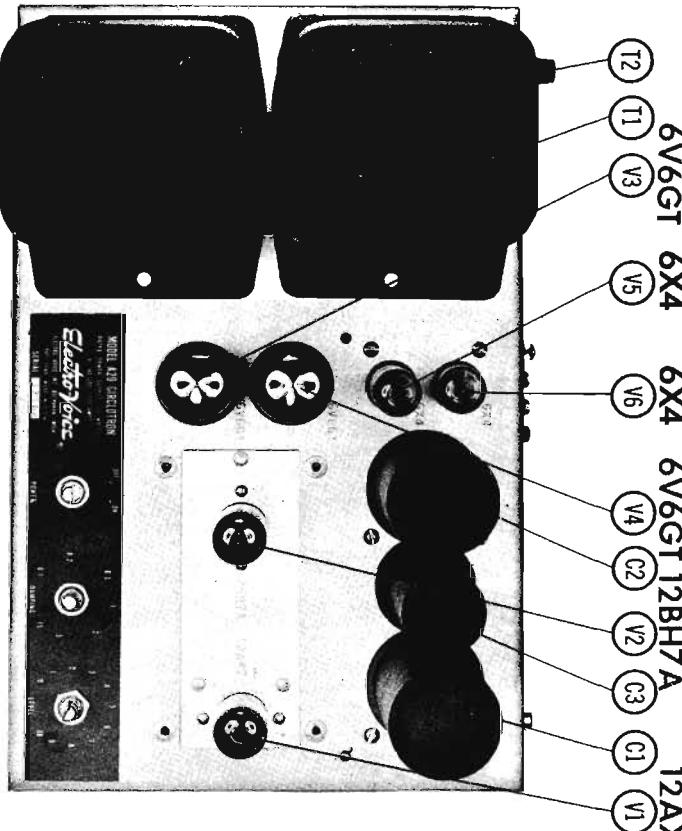
ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST- ANCE	WATTS	Electro-Voice PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
RIA D	250K Shaft	½	J4686 Not Req.	B-51 Not Req.	A47-250K-Z FS-3	Q13-180 Not Req.	U44 Not Req.	Level Attach to RIA
R2A B	1Ω 180Ω	2	K4686					Damping factor- wire wound Damping factor- wire wound

## **RESISTORS**

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

ITEM No.	REPLACEMENT DATA			NOTES	
	OHMS	WATT	Electro-Voice PART No.	IRC PART No.	
R3	270K	4669	BTS-270K		
R4	27K	4651	BTS-27K		
R5	1.2Meg	4656	BTS-1.2Meg		
R8	27K	4651	BTS-27K		
R7	470Ω	4654	BTS-470		
R8	27K	4651	BTS-27K		
R9	4.4KΩ	4650	BTS-4.4K		
R10	470K	4650	BTS-470K		
RU	13K	2	4678	BTS-13K	
RU	13K	2	4679	BTS-13K	
R13	1200Ω	4658	BTS-1200		

## **CHASSIS—TOP VIEW**



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Electro-Voice PART No.	Hollderson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .69A	110VCT @ .020A	715VCT @ .025A	8.3VAC @ .05A	SEC. 4 20VAC *	1580				

\* Bias supply.

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES
		Electro-Voice PART No.	Hollderson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	3000Ω tap @ 8Ω, 4Ω	1579						

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			LITTLEFUSE PART No.		BUSS PART No.		HOLDER	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	SAG S/B	1½A 125V			J1301.5 (SAG S/B 1½A)	342001	MDL 1½	HXP

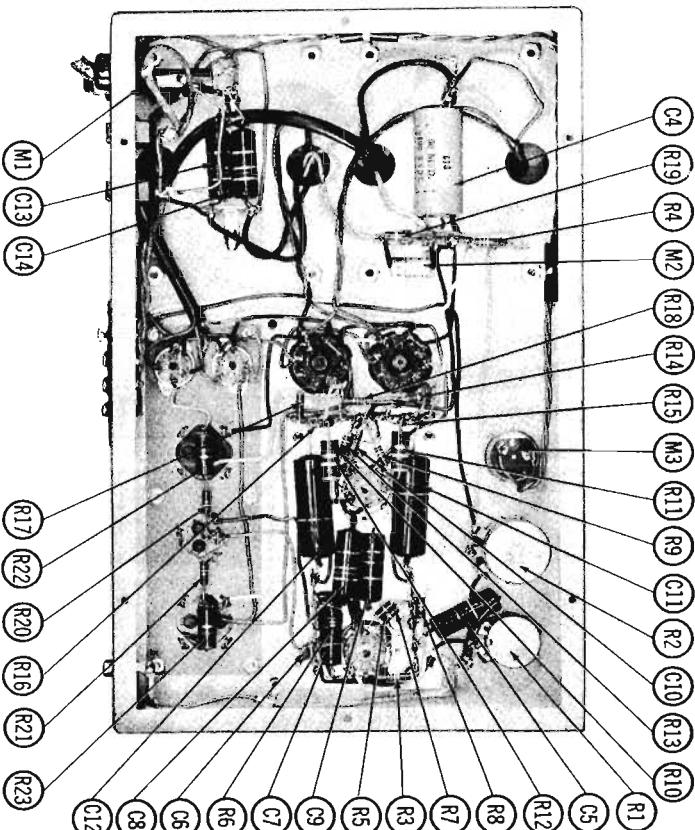
### SELENIUM RECTIFIER

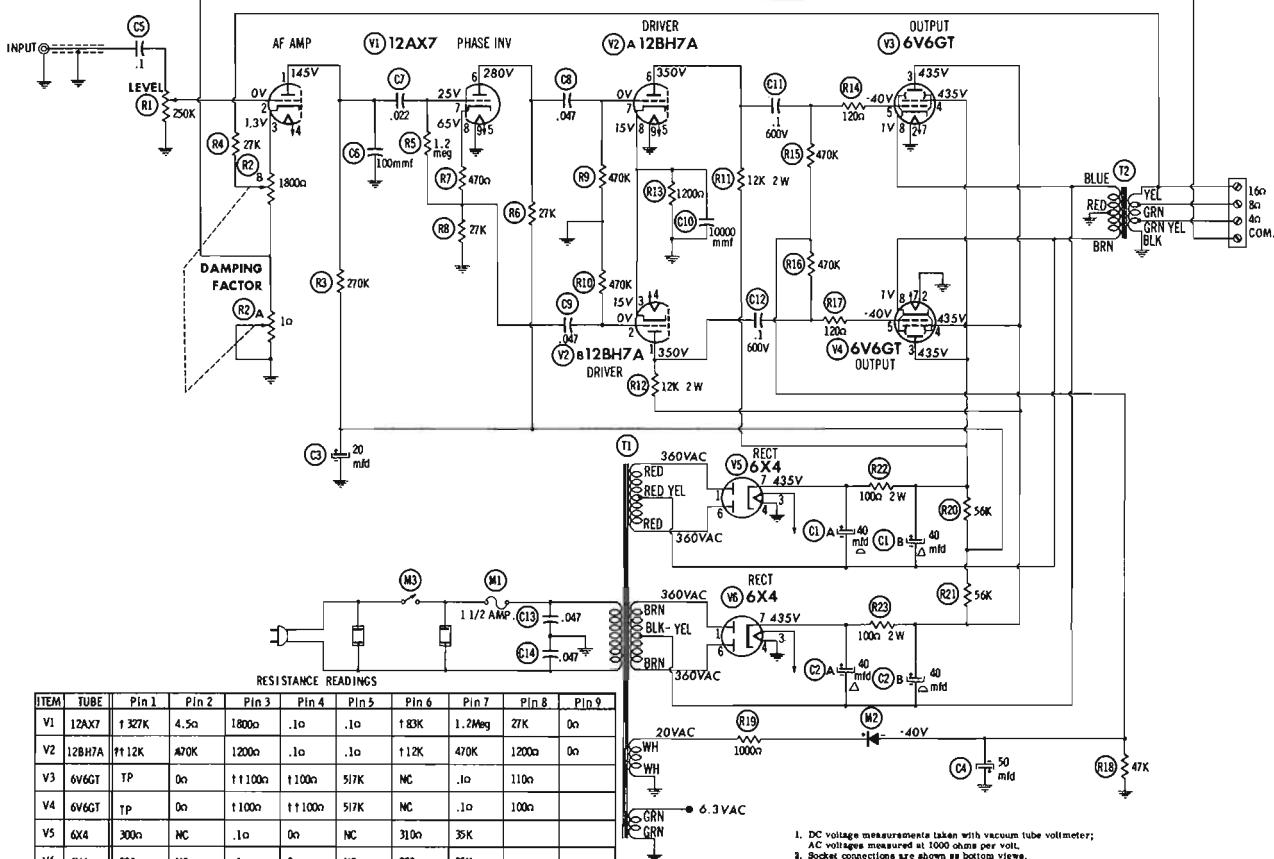
ITEM No.	RATING		REPLACEMENT DATA					NOTES
	CURRENT	Electro-Voice PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M2		5814	1159	CR10	8820		10	

### MISCELLANEOUS

ITEM No.	PART NAME		Electro-Voice PART No.	REPLACEMENT DATA		
M3	Switch		B5641	On-off (power) SPBT		

### CHASSIS—BOTTOM VIEW





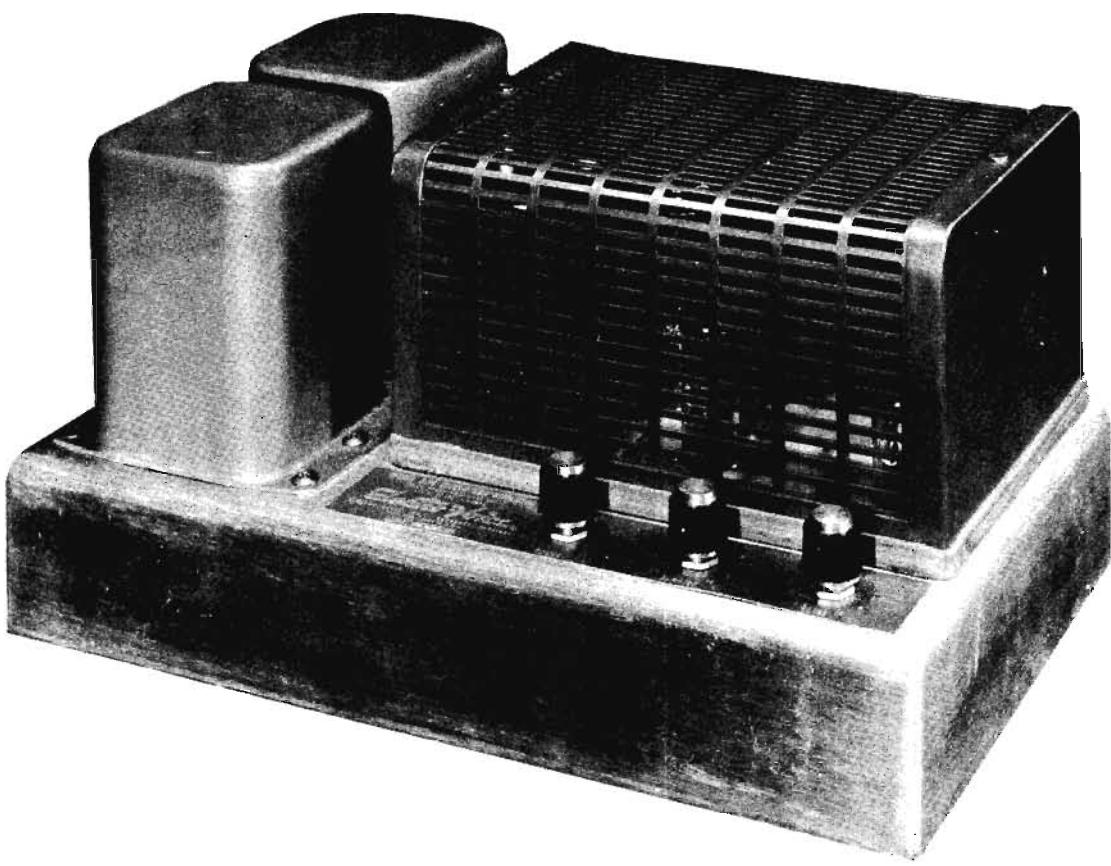
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages multiplied by 1,000 ohms per volt.
2. Double connections are shown as both wires.
3. Measured values are from socket pins to common negative.
4. Line voltage maintained at 117 volt for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

# PHOTOFAC<sup>\*</sup> Folder

\*TRADE MARK



## ELECTRO-VOICE MODEL A30



**ELECTRO-VOICE  
MODEL A30**

TRADE NAME	Electro-Voice Model A30
MANUFACTURER	Electro-Voice, Inc., Buchanan, Michigan
TYPE SET	AC Operated 30 Watt Audio Amplifier
TUBES (Six)	Types 12AX7 AF Amp. -Phase Inv., 12BH7A Driver, (2) 1614 Output, (2) 5Y3GT Rectifier
POWER SUPPLY	105-125 Volts AC - 60 Cycles
	RATING 1 Amp. @ 117 Volts AC (110 Watts)

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

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp -Phase Inverter	12AX7	
V2	Driver	12BH7A	
V3	Output	1614	

ITEM No.	USE	TYPE	NOTES
V4	Output Rectifier	1614	
V5	Rectifier	SY3GT	
V6	Rectifier	SY3GT	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Electro-Voice PART No.	AEROVOX PART No.	CORNELL-DUBLIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.40	500	4247	AFH2-72	B0530	FP288	TMD-62	D-275	TVL-2940
C1B	.40	500							
C2A	.40	500	4247	AFH2-72	B0530	FP288	TMD-62	D-275	TVL-2940
C2B	.40	500							
C3	.20	450	4246	AFH1-50	AO460	FP144	TMS-55	S-260	TVL-1714
C4	.50	100	4242	PRSI05V	BR5016	TC49	TD-00-150	FM-1550	TVA-141

### 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.	Electro-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	.1	200	4265	P288N-1	DF-104	CUB2P1	J107I	GEM-401	2TM-P1	
C6	.100		4281	BPD-0001	DD-101	CUB4S22	ED-100	UC-531	5GA-T1	
C7	.022	400	4280	BPD-02	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22	
C8	.022	400	4280	BPD-02	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22	
C9	.1	600	4241	P1688N-1	DF-104	CB10P1	ED-000	GEM-801	6TM-P1	
C10	10000		4257	BPD-01	DD-202	CUB4S22	ED-000	GEM-401	2TM-P1	
C11	.022	400	4280	BPD-02	DD-203	CUB4S22	ED-02	GEM-4122	4TM-S22	
C12	.022	400	4280	BPD-02	DD-203	CUB4P1	ED-000	GEM-801	6TM-P1	
C13	.047	400	4241	P1688N-1	DF-104	CUB4S47	ED-000	GEM-4147	4TM-S47	
C14	.047	400	4243	BPD-05	DF-503	CUB4S47	ED-000	GEM-4147	4TM-S47	
C15	.05	1600	P1688N-05	BPD-05	DF-503	CUB16S5	ED-000	GEM-1815	16TM-S5	
C16	.05	1600	P1688N-05	BPD-05	CUB16S5	ED-000	ED-000	GEM-1815	16TM-S5	Note 1 Note 1

Note 1: Not used in some versions.

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	Electro-Voice PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	250K	1/2	J4686	B-51	A17-250K-Z	Q13-130	U44		Level
R2A	1G	2	X4686	Not Req.	F5-3	Not Req.	Not Req.		Damping (Wire-wound)
R2B	1800Ω	2							Damping (Wire-wound)

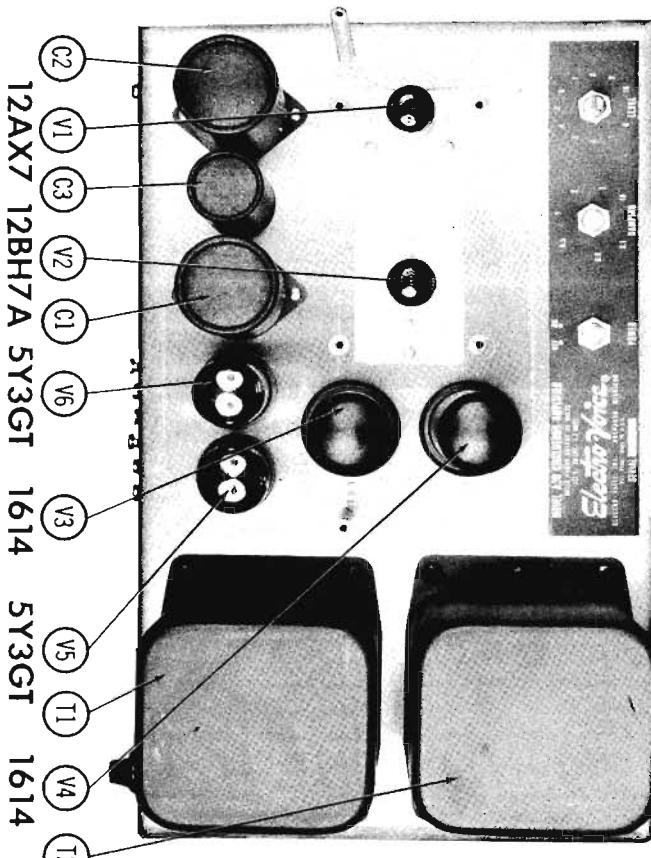
### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	OHMS	WATT	Electro-Voice PART No.	IRC PART No.					
R3	270K		4885	BT3-270K		4885	BT3-1800		
R4	2.70 5%	1	4880			4880	BT3-470K		
R5	3K		4885	BTS-33K		4885	BT3-470K		
R6	1.2Meg		4886	BTS-1.2Meg		4886	BT3-1200		
R7	27K		4885	BTS-27K		4885	BT3-1200		
R8	4700		4884	BTS-470		4884	BT3-47K		
R9	27K		4885	BTS-27K		4885	BT3-47K		
R10	58K		4882	BTS-58K		4882	BT3-1200		
R11	58K		4882	BTS-58K		4882	BT3-1200		
R12	470K		4885	BTS-470K		4885	BT3-470K		
R13	12K	2	4879	BTS-12K		4879	1000Ω	4883	
R14	270K	2	4850	BTS-470K		4877	1000Ω	4884	
R15	12K	2	4878	BTS-12K		4878	1000Ω	4884	

Note 1: Not used in some versions.

### CHASSIS—TOP VIEW



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

### **TRANSFORMER (POWER)**

#### **TRANSFORMER (AUDIO OUTPUT)**

ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES
		Electro-Voice PART No.	Holdson PART No.	Marin PART No.	Stoncor PART No.	Thordson PART No.	Triad PART No.	
	PRI. SEC.							
T2	1600Ω CT Tap@ 70V	1593						

## **SELENIUM RECTIFIER**

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	CURRENT	Electro-Voice PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	
M1	5914	1159	CR10	8520		10	

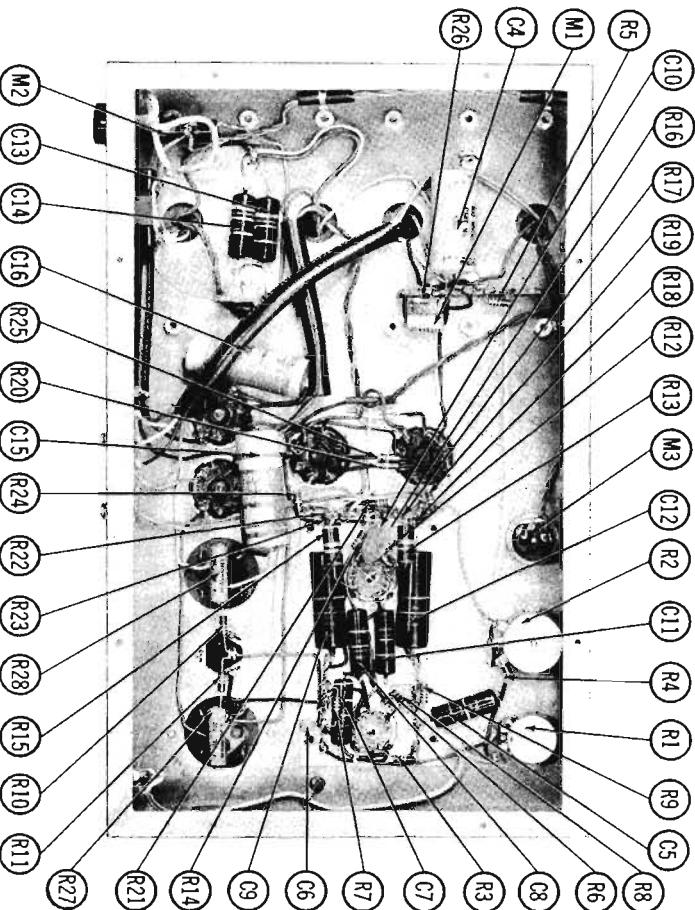
## FUSES

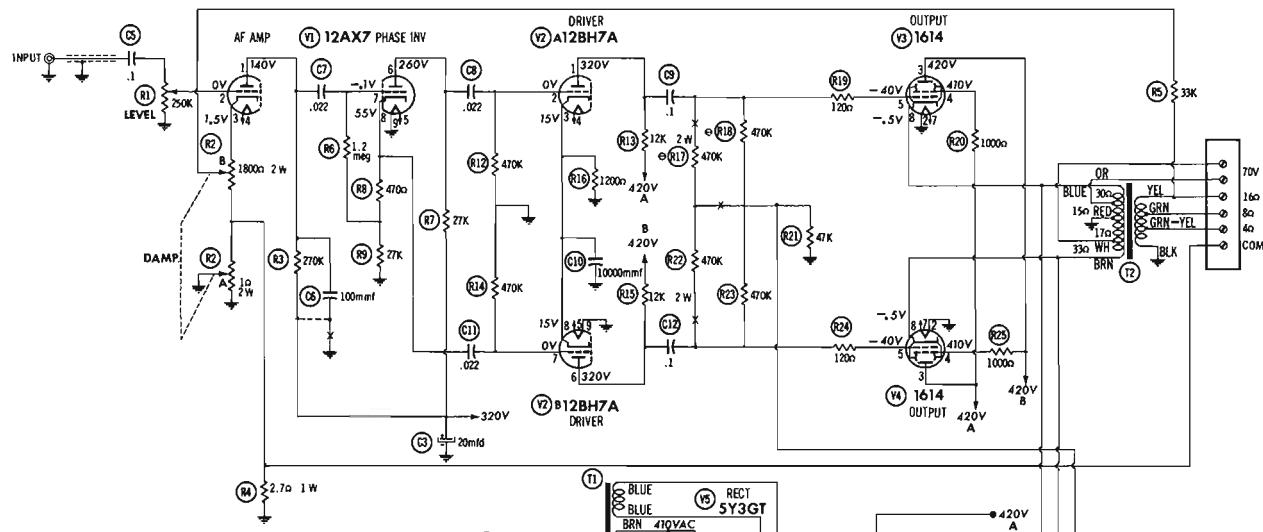
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Electro-Voice PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG S/B	2A 125V	20143		310002, (3AG-S/B- 2A)	342001	MDX 2	HKP

## MISCELLANEOUS

ITEM No.	PART NAME	Electro-Voice PART No.	NOTES
M3	Switch	B5641	On-Off, Rotary

## **CHASSIS—BOTTOM VIEW**





④ 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	12AX7	+50K	0a	1800n	.2a	.2a	+80K	1.2Meg	ZTK	0a
V2	12BHTA	+112K	470K	1200n	.2a	.2a	+12K	470K	1200a	0a
V3	1614	TP	0a	+100n	+11000n	300K	NC	.2a	44a	
V4	1614	TP	0a	+1100n	+1000n	300K	NC	.2a	48a	
V5	5Y3GT	NC	80K	NC	140a	NC	140a	NC	80K	
V6	5Y3GT	NC	80K	NC	130a	NC	130a	NC	80K	

MEASURED FROM PIN 8 OF NC

MEASURED FROM PIN 8 OF V6  
MEASURED FROM PIN 8 OF V6

MEASURED FROM  
NO CONNECTION

NO CONNECTION POINT

#### A PHOTOFACT STANDARD NOTATION SCHEMATIC

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- WH**                  **6.3**

**GRN**                  **VAC**

**GRN**

**BLK** — **RED**

  - DC voltage measurements taken with vacuum tube voltmeter;
  - AC voltage measurement at 1000 ohms per volt.
  - Socket connections are shown at bottom vires.
  - Measured values are from socket pin to common negative.
  - Line voltage maintained at 117 volts for voltage readings.
  - Nominal tolerance of component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
  - All controls at minimum, armor output lead connected.

# PHOTOFAC<sup>\*</sup> Folder



ELECTRO-VOICE  
MODEL PC2



ELECTRO-VOICE  
MODEL PC2

TRADE NAME	Electro-Voice Model PC2
MANUFACTURER	Electro-Voice Inc., Buchanan, Mich.
TYPE SET	AC Operated Equalizer Preamplifier
TUBES (Three)	Types 12AX7 Phono Preamplifier, 12AX7 AF Amplifier, 6X4 Rectifier
POWER SUPPLY	105-125 Volts AC - 60 Cycles      RATING .22 Amp. @ 117 Volts AC

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Phono Preamplifier	12AX7	
V2	AF Amplifier	12AX7	

ITEM No.	USE	TYPE	NOTES
V3	Rectifier	6X4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Electro-Voice PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.20	350	42045						
B	.20	350							
C	.20	350							
C2	.12	250		(Note 1)					
C3	.20	25	42046	PR8250V12	BBR12-250	TC53	TD-12-250	FM-2512	TVA-1505
				PR850V20	BBR20-25	TC26	TD-25-25	FM-0225	TVA-1205

Note 1: Not used in some versions.

### FIXED CAPACITORS

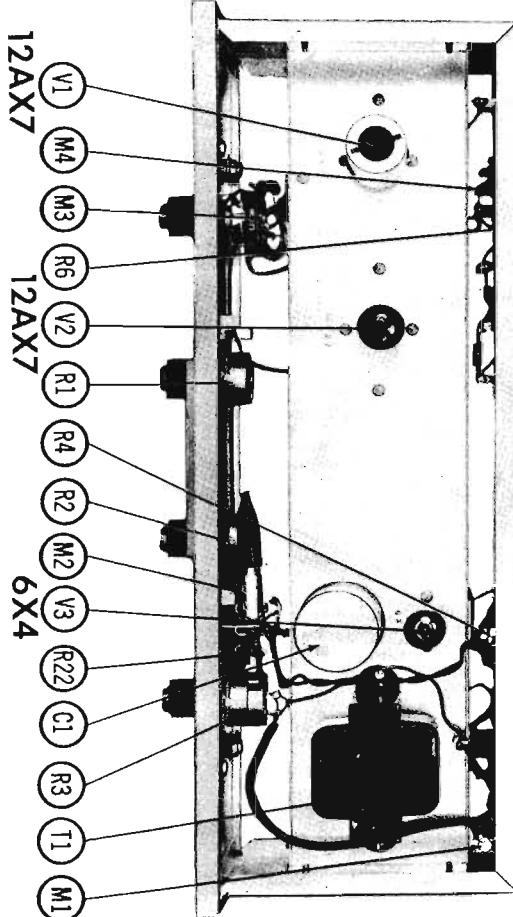
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	Electro-Voice PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.
C4	100000		4252	BPD-01	DD-103	BYA851	GP-10000	DC511	5HK-S1
C5	5000		42002	BPD-005	DD-503	BYA102D	GP-5000	DC525	5HK-D5
C6	100000		4252	BPD-002	DD-103	BYA1051	GP-10000	DC511	5HK-S1
C7	2000		4259	BPD-002	DD-202	BYA102D	GP-2000	DC522	5HK-D2
C8	100000		4252	BPD-002	DD-103	BYA1051	GP-10000	DC511	5HK-S1
C9	.032							DC511	5HK-S1
C10	.500	400	4245	P48BN-1	DD-104	CUB4PI	ED-500	UC-535	4TM-PI
C11	.500	400	42003	BPD-0005	DD-503	BYA1075	ED-500	UC-535	5CA-T5
C12	.1	400	42003	BPD-0005	DD-501	BYA1075	ED-500	UC-535	5CA-T5
C13	.200		4245	P48BN-1	DF-104	CUB4PI		GEM-401	4TM-PI
C14	2000		4256	BPD-0002	DD-201	LUDT2	ED-200	UC-532	5GA-T2
C15	10000		4257	BPD-01	DD-103	BYA851	GP-10000	DC511	5HK-S1
C16	1000		4258	BPD-002	DD-102	BYA6D2	ED-1000	DC521	5HK-D1
C17	.1	#00	4245	P48BN-1	DF-104	CUB4PI	GEM-401	4TM-PI	

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	Electro-Voice PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	50K	1	A46086	B-32	A47-50K-Z	Q13-123	U33	Volume	
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.		
R2A	1Meg	1	A4686	B-70	A47-1Meg-Z	Q13-131	U53	Treble	
B	1C			Not Req.	FS-3	Not Req.	Not Req.		
R3A	1Meg	1	Z4686	B-70	A47-1Meg-Z	Q13-137	U53	Bass	
B	Shaft			Not Req.	KB-1	Not Req.	Not Req.		
C	Switch				SWE-12	76-1	US-26		
R4A	5000	1	R4686	A-B-4	A47-500-S	Q11-103	U2	Hum Balance (Ceramic)	
B	Shaft			AK-1	FKS-1/4	RQ	Not Req.		
R5A	5000	1	R4686	A-B-4	A47-500-S	Q11-103	U2	Hum Balance (Magnetic)	
B	Shaft			AK-1	FKS-1/4	RQ	Not Req.		

### 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
	OHMS	WATT	Electro-Voice PART No.	IRC PART No.		
R6	22M-6K	4656	BTS-22M6G			
R7	47K	4659	BTS-47K			
R8	120K	4670	BTS-120K			
R9	2200Ω	4676	BTS-2200			
R10	12Meg	4672	BTS-12Meg			
R11	120K	4670	BTS-120K			
R12	1.2Meg	4656	BTS-1.2Meg			
R13	120K	4670	BTS-120K			
R14	1.2Meg	4656	BTS-1.2Meg			
R15	270K	4659	BTS-270K			
R16	120K	4659	BTS-120K			
R17	1.0Meg	4673	BTS-1.0Meg			
R18	50K	4652	BTS-1.0K			
R19	1200Ω	4658	BTS-1200			

Note 1: Not used in some versions.

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PR1	SEC. 1	SEC. 2	SEC. 3	Electro-Voice PART No.	Holderson PART No.	Merit PART No.	Stoncor PART No.	Thordarson PART No.	Tried PART No.
T1	117VAC @ .22A	455VCT @ .055A	6.3VAC @ .3A	.3A	15021					

### FUSES

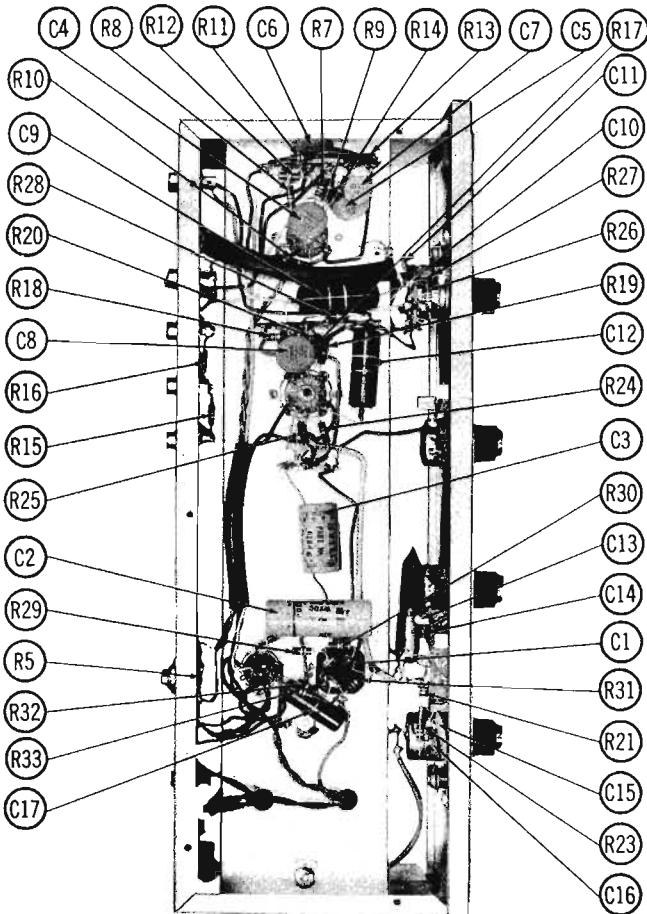
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Electro-Voice PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	1/2A 250V	(Note 1)		312, 500 (3AG-1A- 250V)	356001	AGC 1/2	4405

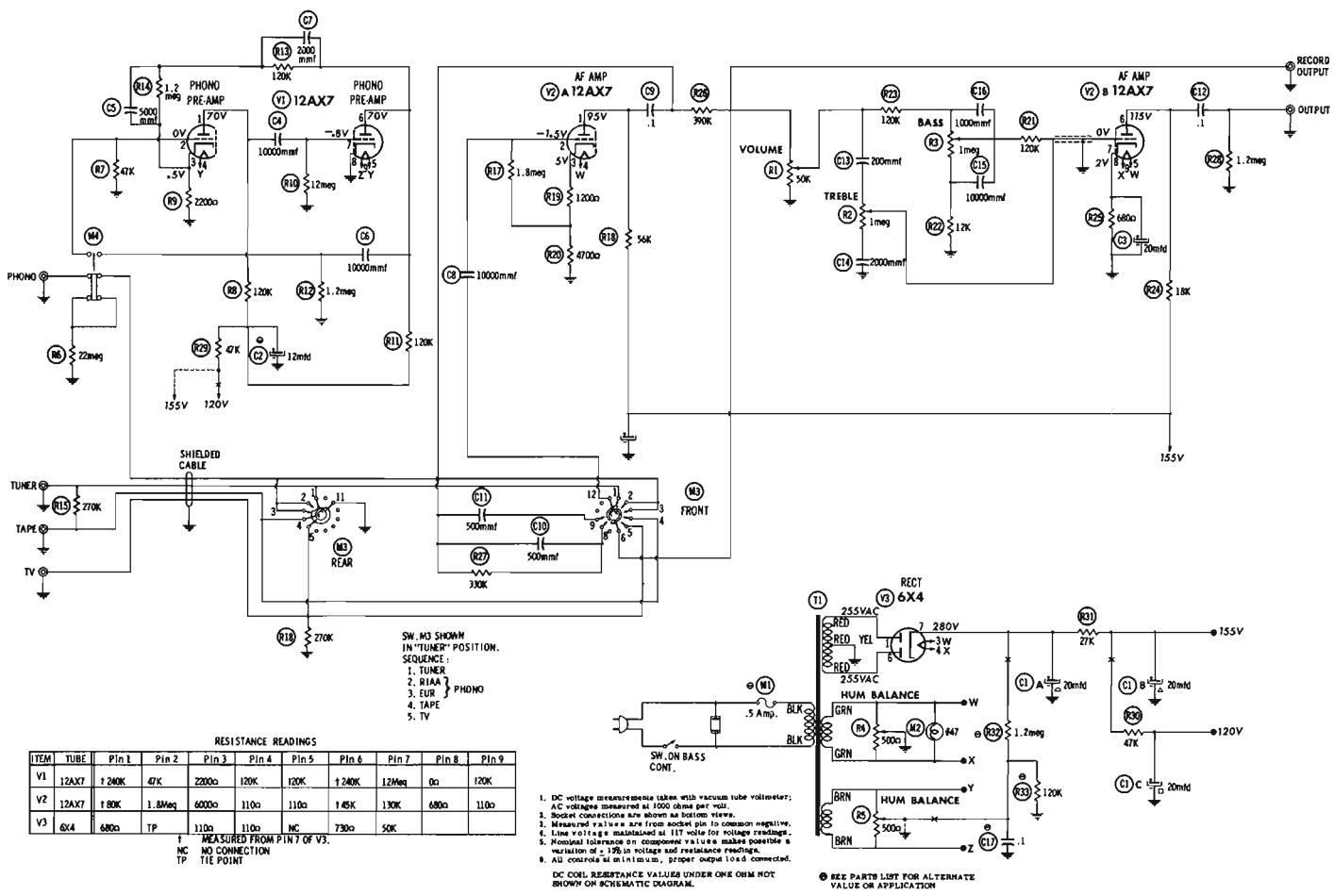
Note 1: Some versions may use 3AG, 1A, 250V, S/B (Part #2-20060) in this application.

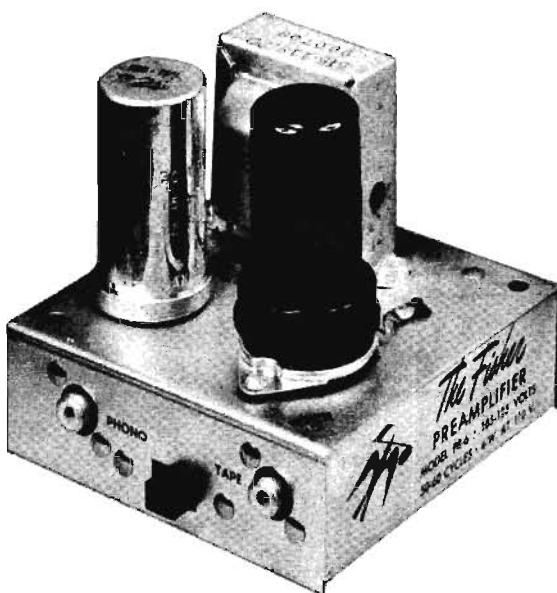
### MISCELLANEOUS

ITEM No.	PART NAME	Electro-Voice PART No.	NOTES
M2	Pilot Light		#47
M3	Switch		Function (Rotary, Water Type)
M4	Switch		Ceramic-Magnetic Changeover

### CHASSIS—BOTTOM VIEW







TRADE NAME Fisher Model PR-6

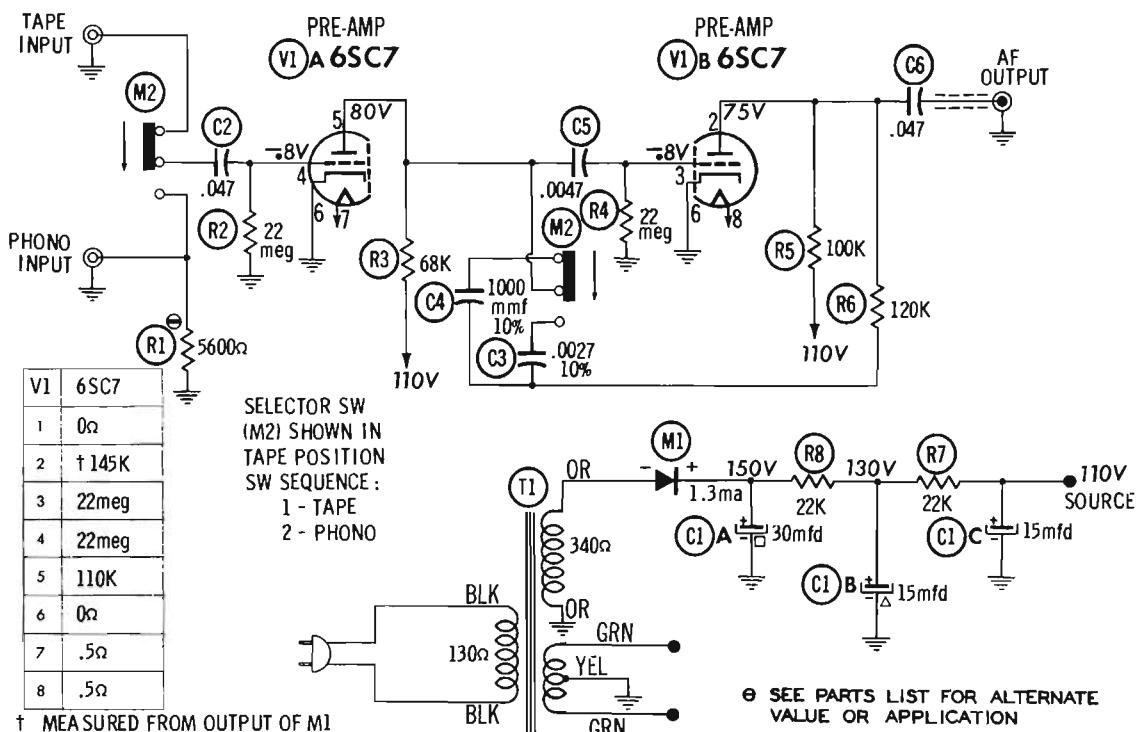
MANUFACTURER Fisher Radio Corp., 21-21 44th Drive, Long Island City 1, N.Y.

TYPE SET AC Operated Preamplifier

TUBES (One) Type 6SC7 Preamplifier

POWER SUPPLY 105-125 Volts AC-50/60 Cycle RATING .04 Amp. @117 Volts AC (4 Watts)

**FISHER  
MODEL PR-6**



## A PHOTOFAC STANDARD NOTATION SCHEMATIC

Howard W. Sams &amp; Co., Inc. 1958

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Preamplifier	6SC7	

ITEM No.	USE	TYPE	NOTES

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	FISHER PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CIA	■ 30	150	CS15-122	AFH3-17-50	C0070	FP311.4	TMT-7	T-035	TVL-3437
B	▲ 15	150							
C	15	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							
	CAP.	VOLT.	FISHER PART No.	AEROVOX PART No.	CENTRAL PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.047	200	C68P473M2	P288N-047	DF-503	CB2S47				
C3	.0027	200	C68P272K2							
C4	1000	200	CC26GP102K5	P288N-0047	D6-472	IR5DI	ED-1000	MCB255	STM-21	10%
C5	.0047	200	C68P472F2	P288N-047	DF-503	CB2S47	GP-4700	GEM-8247	5TM-D47	10%
C6	.047	200	C68P473M2	P288N-047				GEM-4147	2TM-S47	

### 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		
R1	5600Ω		RC20BF562K	Note 1	R5	100K		RC20BF104K	
R2	22meg		RC20BF226K		R6	120K		RC20BF124K	
R3	68K		RC20BF683K		R7	22K		RC20BF223K	
R4	22meg		RC20BF226K		R8	22K		RC20BF223K	

Note 1 Chassis with pickering cartridge use 390Ω in this application

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	FISHER PART No.	Hallderson PART No.	Marl PART No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	117V ③ .04A	115V ③ .0013A	6.3VCT ③ .300A	T-515-118						

### SELENIUM RECTIFIER

ITEM No.	RATING		REPLACEMENT DATA			NOTES
	CURRENT (Measured)	FISHER PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.0013A	SR3180	II59 ①	CR-20 ①	10 ①	① Pig Tail Leads

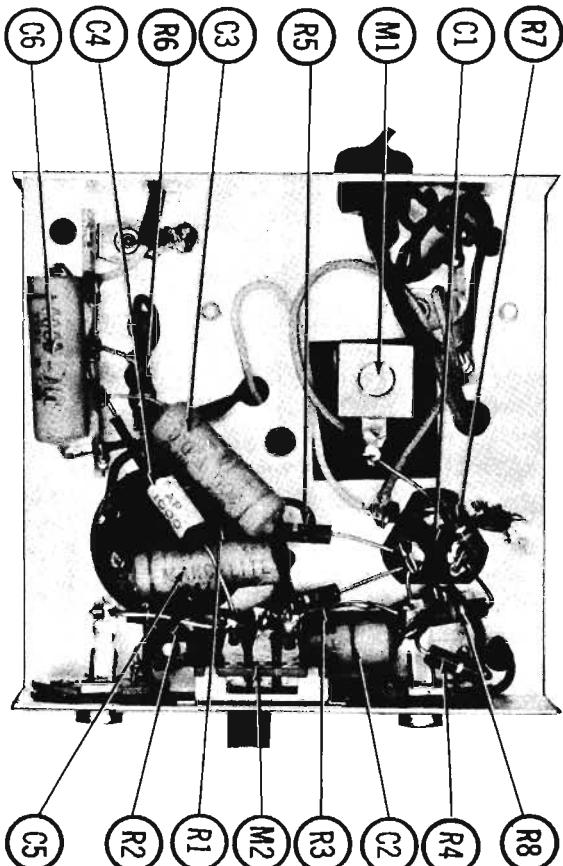
### MISCELLANEOUS

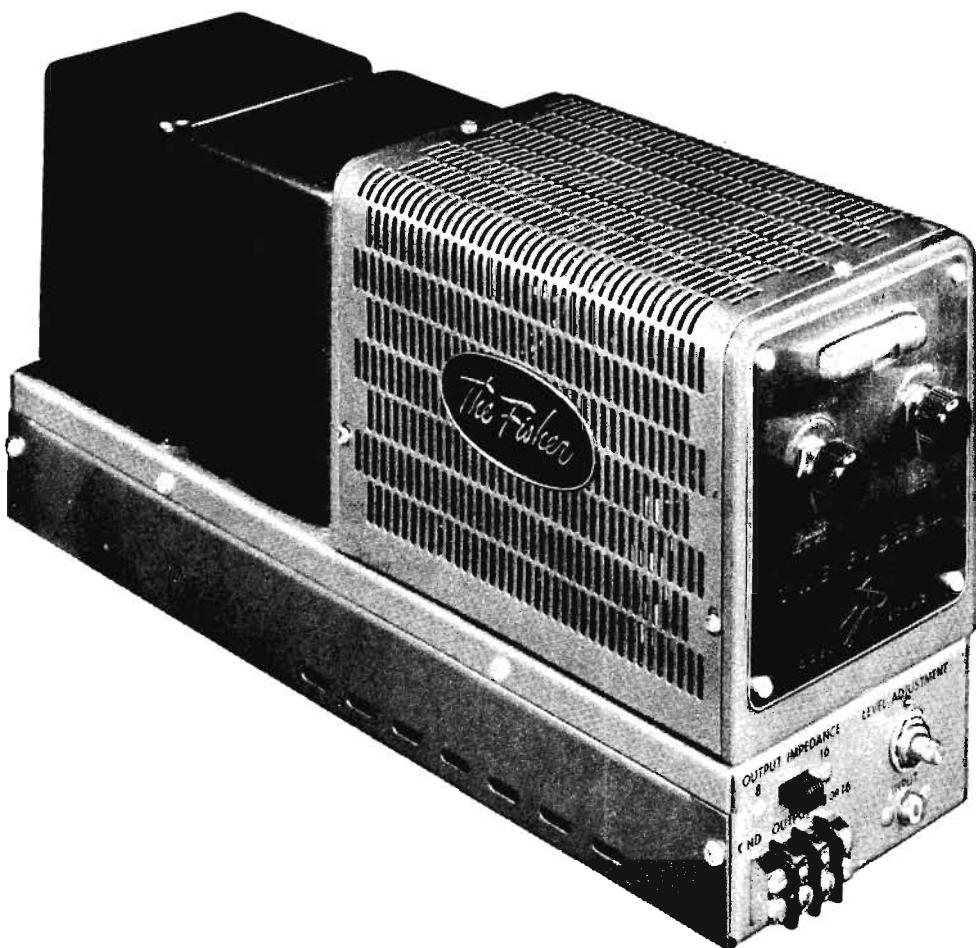
ITEM No.	PART NAME	FISHER PART No.	NOTES
M2	Switch	8-505-117	Phono-Tape (Slide Type DPDT)

### WIRING DATA

General-use Unshielded Hook-up Wire .....	Use BELDEN No. 8530 (Gold) 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. D401
Phono Pick-up Arm Cable .....	Use BELDEN No. 8430 (Two Conductor - Twisted)

## CHASSIS—BOTTOM VIEW





**FISHER  
MODEL 80-AZ**

TRADE NAME	Fisher Model 80-AZ	
MANUFACTURER	Fisher Radio Corp., 21-21 44th. Drive, Long Island City 1, N.Y.	
TYPE SET	AC Operated 30 Watt Audio Amplifier	
TUBES (Five)	Types 12AT7 AF Amp.-Phase Inv., 12AU7A Driver, (2) EL-37 Output, 5V4G Rectifier	
POWER SUPPLY	105-125 Volts AC-50/60 Cycles	RATING 1 Amp. @ 117 Volts AC

**PHASE INVERTER BALANCE ADJUSTMENT**

1. Disconnect the speaker and connect a 16 ohm, 20 watt resistor to "GND" and "8 or 16".
2. Connect the audio generator to the amplifier input.
3. Switch IMPEDANCE SELECTOR to "16".
4. Turn Z-Matic control fully counter clockwise.
5. Connect the wave analyzer or distortion analyzer across the 16 ohm resistor.
6. Set the audio generator to 1000 cycles and adjust the attenuator so that the amplifier produces 20 watts (17.85 volts RMS) across the 16 ohm resistor.
7. Tune the wave analyzer to the second harmonic of 1000 cycles or, if a distortion analyzer is used, tune it for minimum reading at 1000 cycles.
8. Adjust the phase inverter balance control (R4) for minimum distortion.

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp.-Phase Inv.	12AT7	
V2	Driver	12AU7A	
V3	Output	EL-37	

ITEM No.	USE	TYPE	NOTES
V4			
V5	Output Rectifier	EL-37	
		5V4G	

### ELECTROLYTIC CAPACITORS

ITEM No.	CAP.	VOLT.	REPLACEMENT DATA					
			FISHER PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.
C1A	.40	600	C-522-114	AFR2-72	B0630	FP268	TMD-62	D-275
B	.40	500						TVL-2940
C2A	.40	450	C-1796	AFR2-57	B0460	FP238	TMD-54	D-235
B	.40	450						TVL-2784
C3	.60	50	C-508-115	PR850V50	BR505	TC39	TD-50-50	PM-0550
								TVA-1206

### 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							
	CAP.	VOLT.	FISHER PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	.22	200	C69P224V2	P268N-22		CUB2P22	PT4023	2TM-P22		
C5	.22	220	CC-212-221K5	NPO-03220	D6-22L	22RS5T22	8U-221	5TCC-T22		
C6	.022	400	88P1223M4	P488N-022		CUB4P22	8U-08	PT4122	4TM-922	
C7	.022	400	88P1223M4	P488N-022		CUB4P1	8U-03	PT4122	4TM-922	
C8	.1	400	68P104M4	P488N-1	DF-104	CUB4P1	PT401	4TM-P1		
C9	.1	400	68P104M4	P488N-1	DF-104	CUB4P1	PT401	4TM-P1		
C10	5000		C-306-122	DI-006	DD-502	K980	DC-525	5GA-D6		
C11	.047	600	C-68P473M4	BPD-05	D6-820	T228	801-830	PT8147	6TM-947	Note 1
C12	.82			1469-000062	D6-820			ME-482		
C13	.420									
C14	.01	600	C-2747	BPD-01	D6-103	CUB681	GP3-333-103	PT811	6TM-S1	Note 1

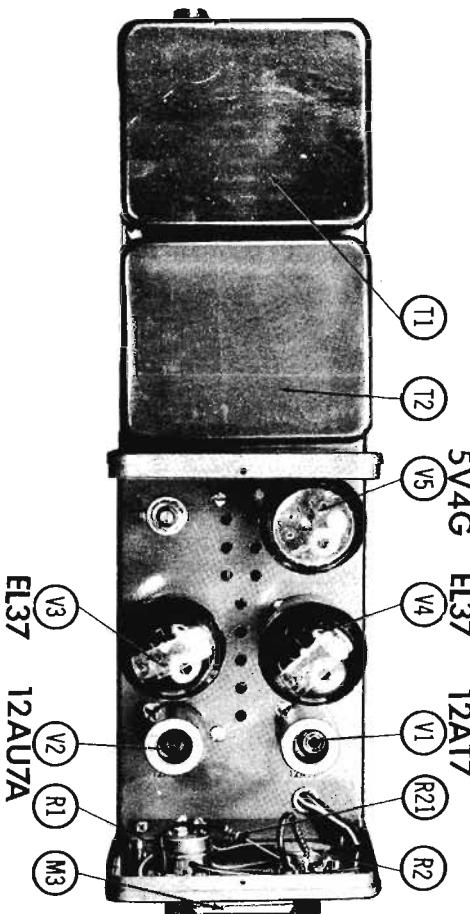
Note 1. Not used in some versions.

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	FISHER PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1000Ω	1/2	R657-128	AB-5	A47-1000-8	Q11-108	U4	Z-Matic
B	Shaft		Not Req.	AK-8	R2-3/16	NC	D2-31	Attach to R1A
C	Switch		R657-121	AK-1	SWE-13	76-1	U2-26	Attach to R1A
R2A	100K	1/2	R657-121	Not Req.			U40	Peak Power
R3A	500K	1/2	R-3815-9	AB-59	A47-500K-8	Q11-133	D8-37	Attach to R2A
B	Shaft		Not Req.	AK-1	FKS-1/4	Not Req.	U6-50	Level
R4A	50K	1/2	R-50000-5	AB-31	A47-50K-8	Q11-123	U3-35	Attach to R3A
R5	35K	1/2	Not Req.	AK-1	FKS-1/4	RQ	Not Req.	Balance
								Attach to R4A
								Peak Power Indicator Note 1.

Note 1. 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	REPLACEMENT DATA		NOTES
		FISCHER PART No.	IRC PART No.	
R6	1800Ω	RC-20BF150K	B7B-1500	
R7	220K	RC-20BF220K	B7B-220K	
R8	10K	RC-20BF203K	B7B-10K	
R9	100K	RC-20BF104K	B7B-100K	
R10	58K	RC-20BF585K	B7B-58K	
R11	470K	RC-20BF474K	B7B-470K	
R12	470K	RC-20BF474K	B7B-470K	
R13	180K	RC-20BF184K	B7B-180K	
R14	180K	RC-20BF184K	B7B-180K	
R16	100Ω	RC-20BF103K	B7B-100Ω	
R17	470K	RC-20BF474K	B7B-470K	
R18	68Ω		B7B-68	Note 1
R19	68Ω		B7B-68	Note 1

Note 1. Not used in some versions.

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA				
	FISCHER PART No.	Hallidson PART No.	Merrit PART No.	Stancor PART No.	Thorderson PART No.	Triod PART No.		
T1	117VAC @1A	800VCT @110ADC @3.2A	T-587-123					

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA					NOTES
		FISCHER PART No.	Hallidson PART No.	Merrit PART No.	Stancor PART No.	Thorderson PART No.	
T2	4300Ω 16Ω CT <sub>1</sub> .94Ω CT <sub>2</sub> .94Ω	T-587-123					

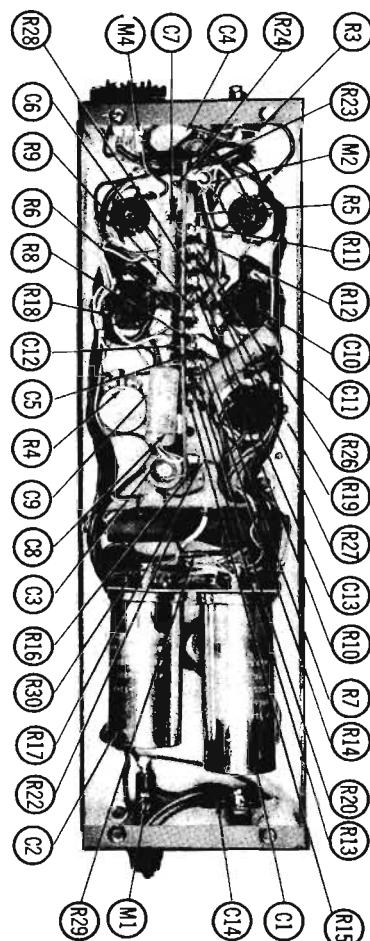
### FUSES

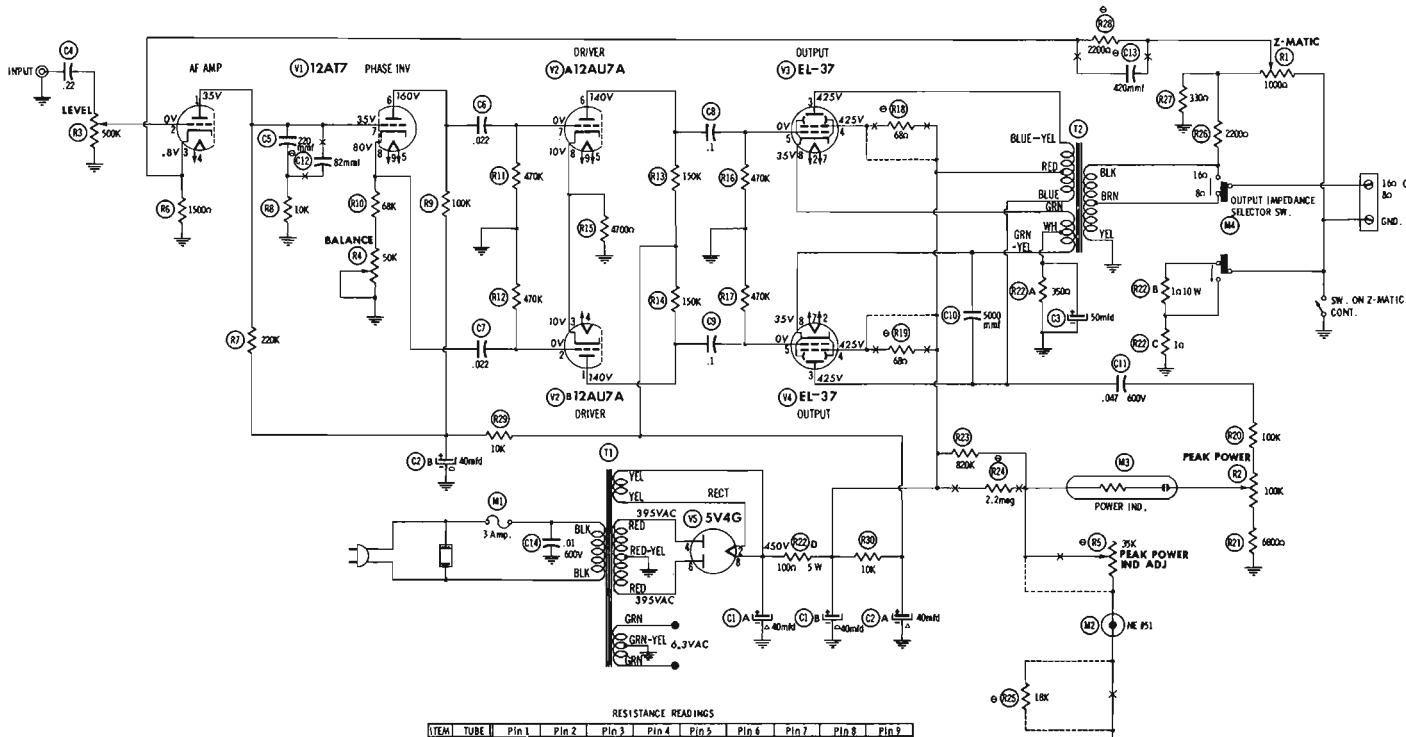
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			FISCHER PART No.		LITTLEFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	SAG	SA 260V			312005. (3AO 3A)	342001	AGC 3	HKP

### MISCELLANEOUS

ITEM No.	PART NAME	FISCHER PART No.	NOTES
M2	Neon Bulb	V-NX-61	#NEBL - Voltage Regulator
M3	Neon Bulb	I-557-120	Power Indicator
M4	Switch	S-505-L17	Output Impedance Selector (DPDT-Slide Type)

### CHASSIS—BOTTOM VIEW





1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured with 1000 ohms per volt.
2. All resistors are 1/2 watt carbon film unless otherwise specified.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Components are standard commercial types. They are available a variation of  $\pm 1\%$  in voltage and resistance readings.
6. AU controls at minimum, proper output load connected.

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AT7	1240K	0a	1000a	.1a	.1a	1120K	1240K	100K	.1a
V2	12AU7A	1160K	470K	470K	.1a	.1a	1160K	470K	4700a	.1a
V3	EL-37	NC	.1a	230a	170a	470K	TP	.1a	370a	
V4	EL-37	NC	.1a	220a	170a	470K	TP	.1a	370a	
V5	5V4G	NC	33K	NC	95a	NC	90a	NC	33K	

1. MEASURED FROM PIN 8 OF V5.

NC NO CONNECTION

TP TIE POINT

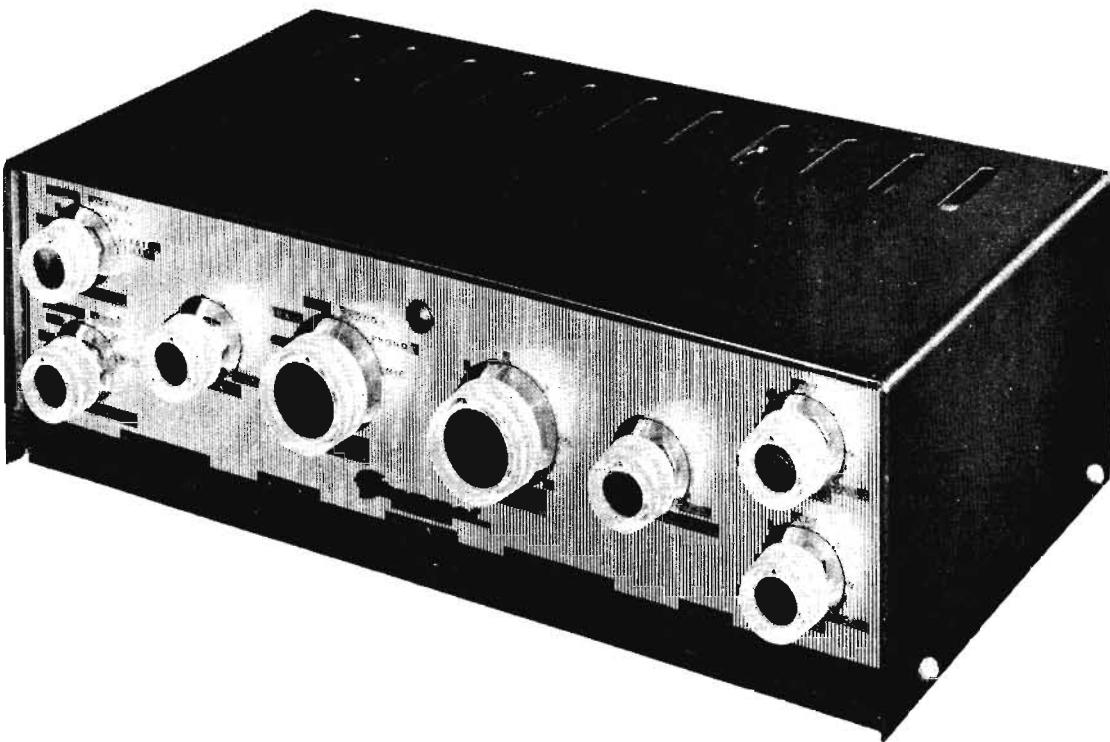
© SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION

# PHOTOFAC<sup>\*</sup> Folder

\*TRADE MARK



## GROMMES MODEL 212



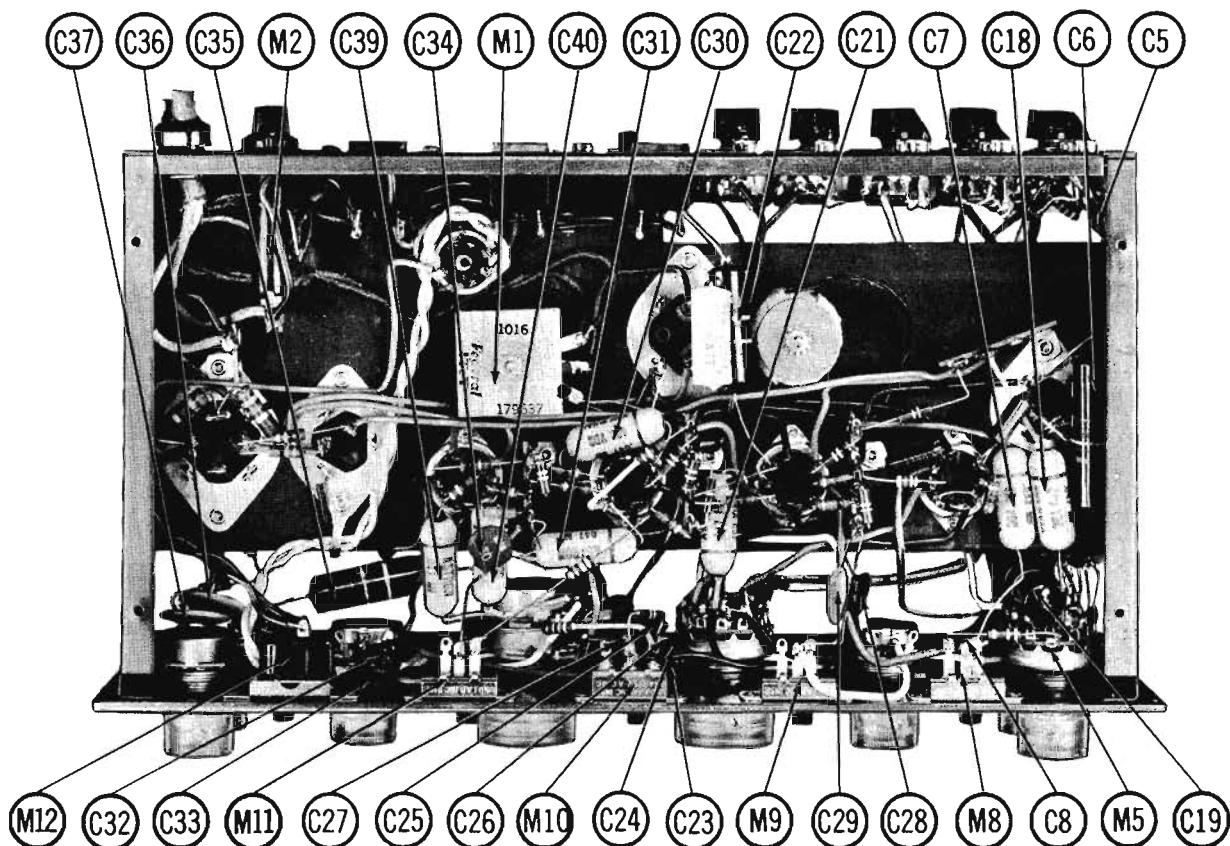
**GROMMES  
MODEL 212**

TRADE NAME	Grommes Model 212	
MANUFACTURER	Precision Electronics, Inc., 9101 King Ave., Franklin Park, Ill.	
TYPE SET	AC Operated 8 Channel Preamplifier	
TUBES (Five)	Types 12AX7 Phono Preamplifier, 12AX7 AF Amp. - Cath. Follower, 12AX7 AF Amplifier, 12AX7 AF Amp. - Cath. Follower, 6X4 Rectifier	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .25 Amp @ 117 Volts AC (22 Watts)

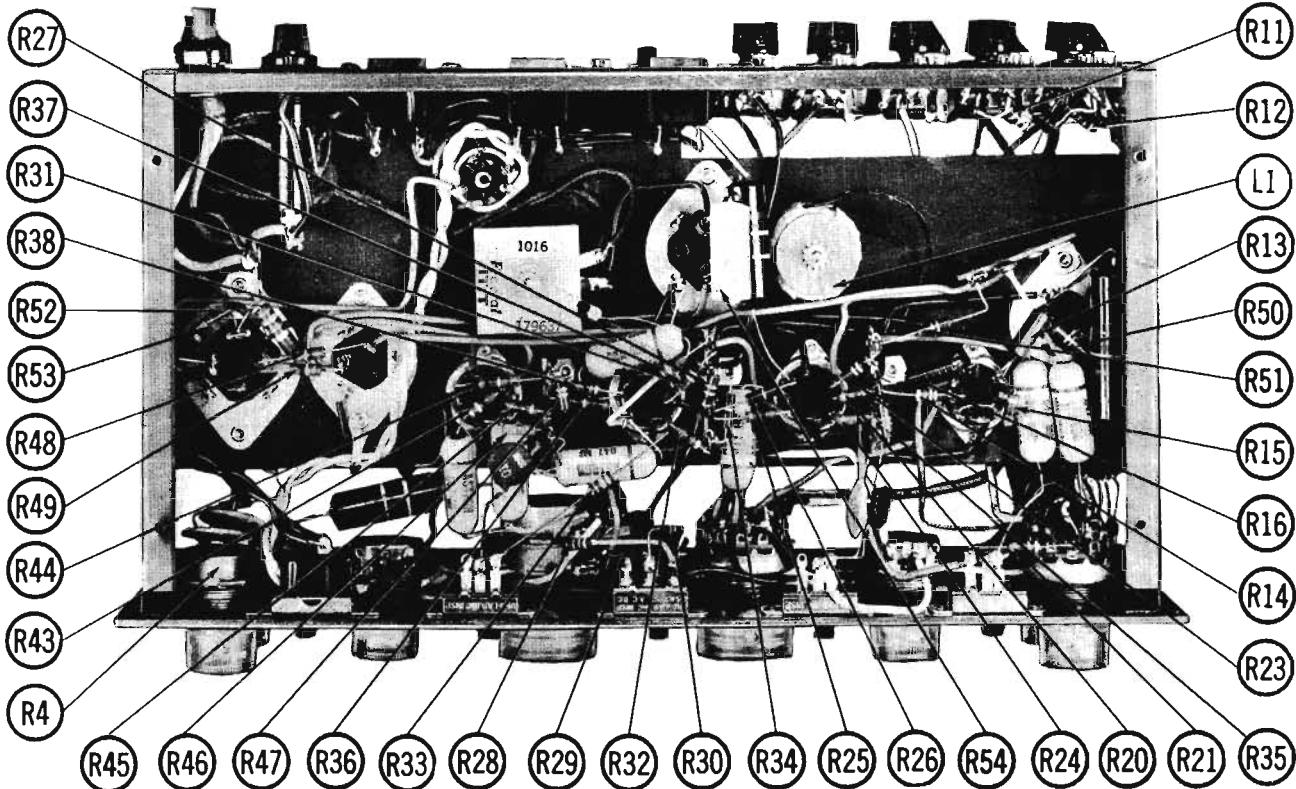
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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

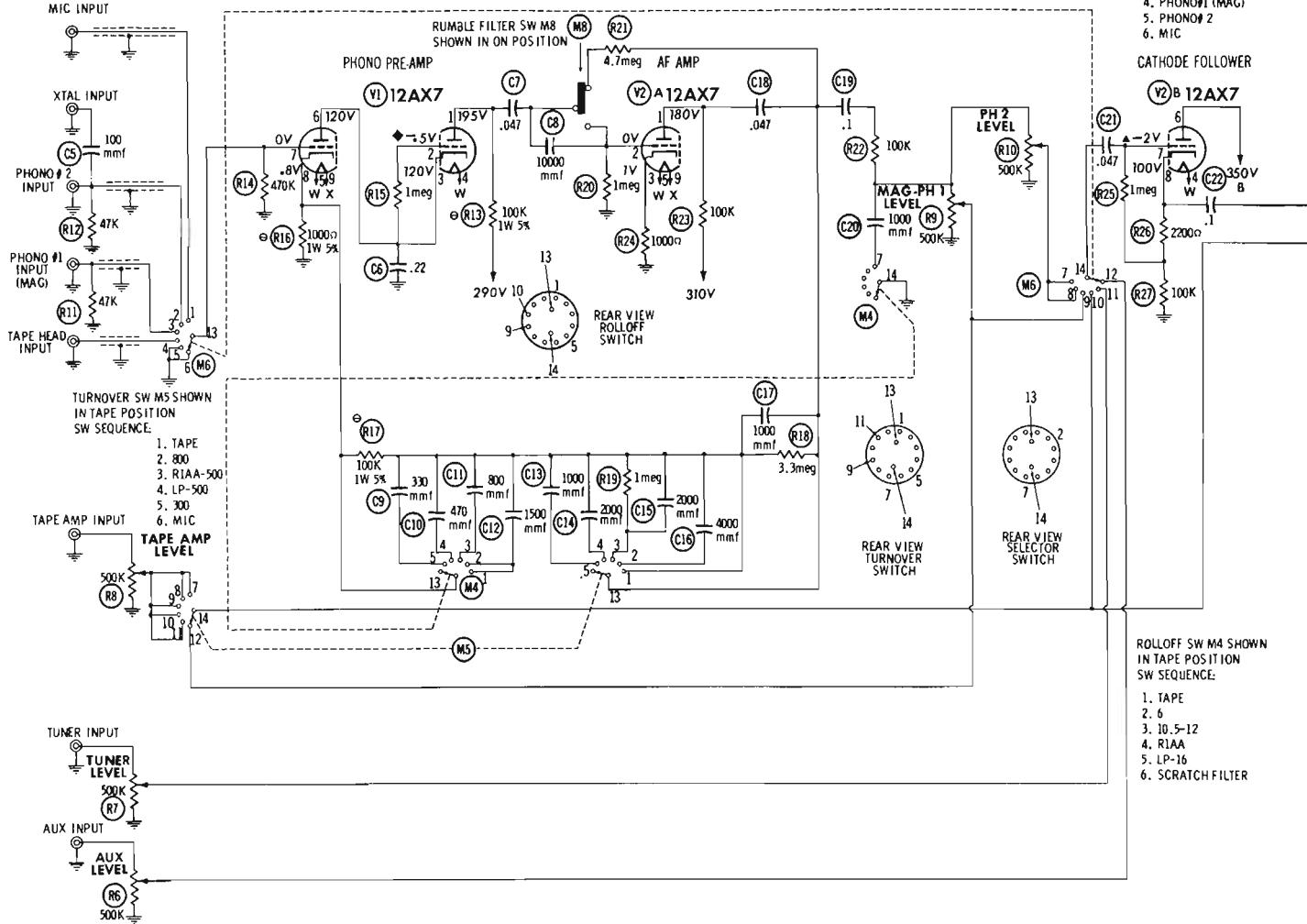


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

SELECTOR SW M6 SHOWN  
IN AUX POSITION  
SW SEQUENCE:

1. AUX
2. TUNER
3. TAPE
4. PHONO#1 (MAG)
5. PHONO#2
6. MIC

CATHODE FOLLOWER



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	† 147K	INF	INF	3Ω	3Ω	INF	0Ω	1000Ω	0Ω
V2	12AX7	† 127K	1Meg	1000Ω	3Ω	3Ω	† 15K	1Meg	100K	6Ω
V3	12AX7	† 115K	1Meg	1000Ω	6Ω	6Ω	† 115K	0Ω	3200Ω	9Ω
V4	12AX7	† 15K	1.1Meg	100K	9Ω	9Ω	† 115K	480K	1000Ω	12Ω
V5	6X4	1100Ω	NC	INF	INF	NC	1200Ω	20K(Min)		

ALL MEASUREMENTS TAKEN IN "TAPE" POSITION

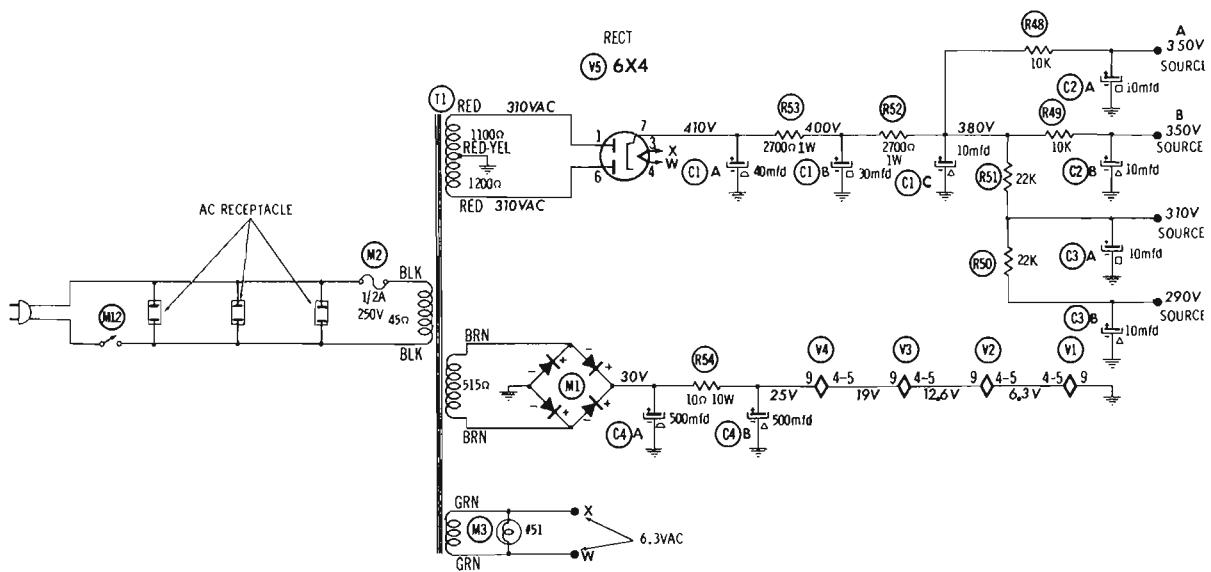
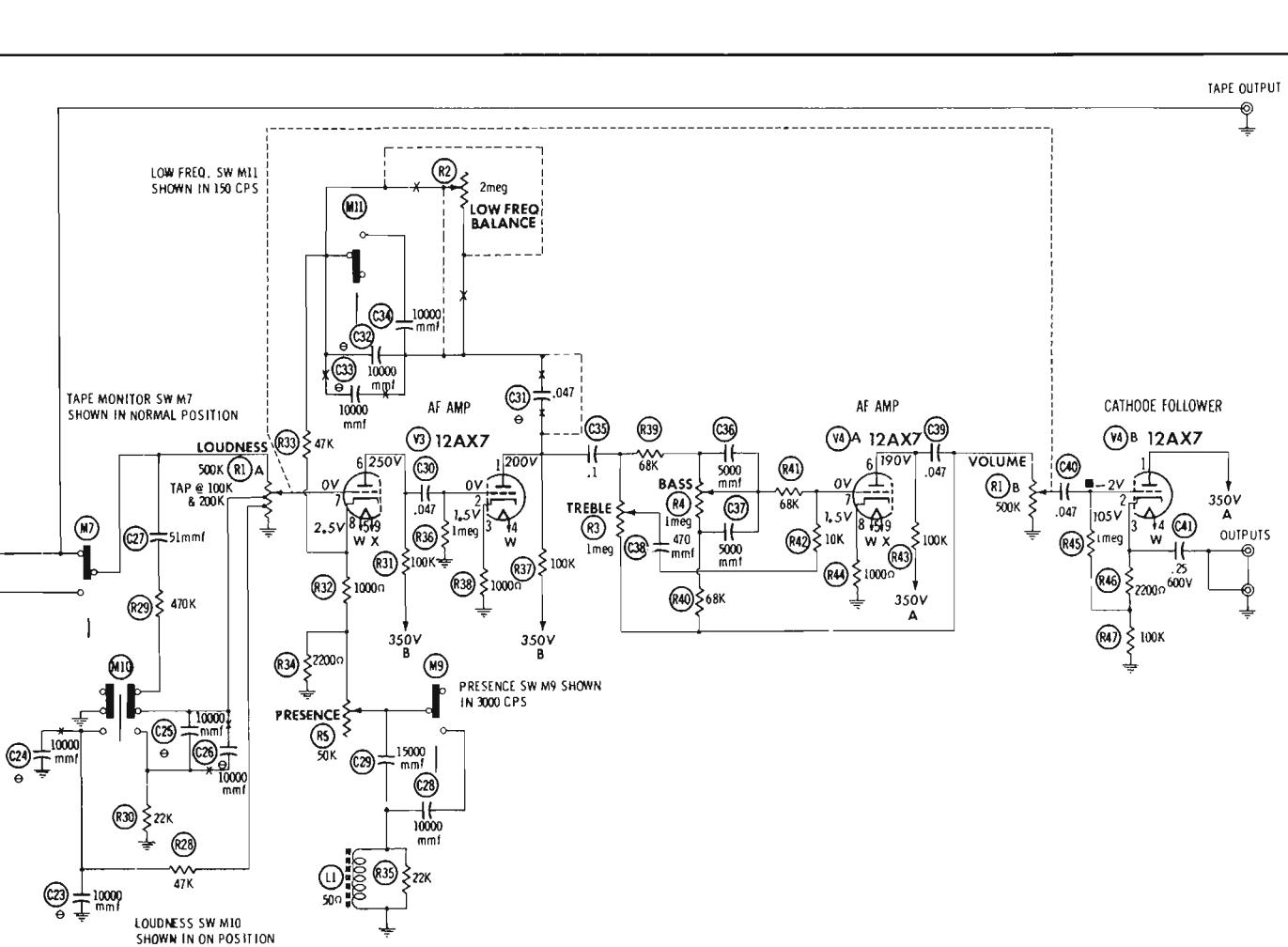
- MEASURED FROM PIN 3 OF V1
- MEASURED FROM PIN 3 OF V4

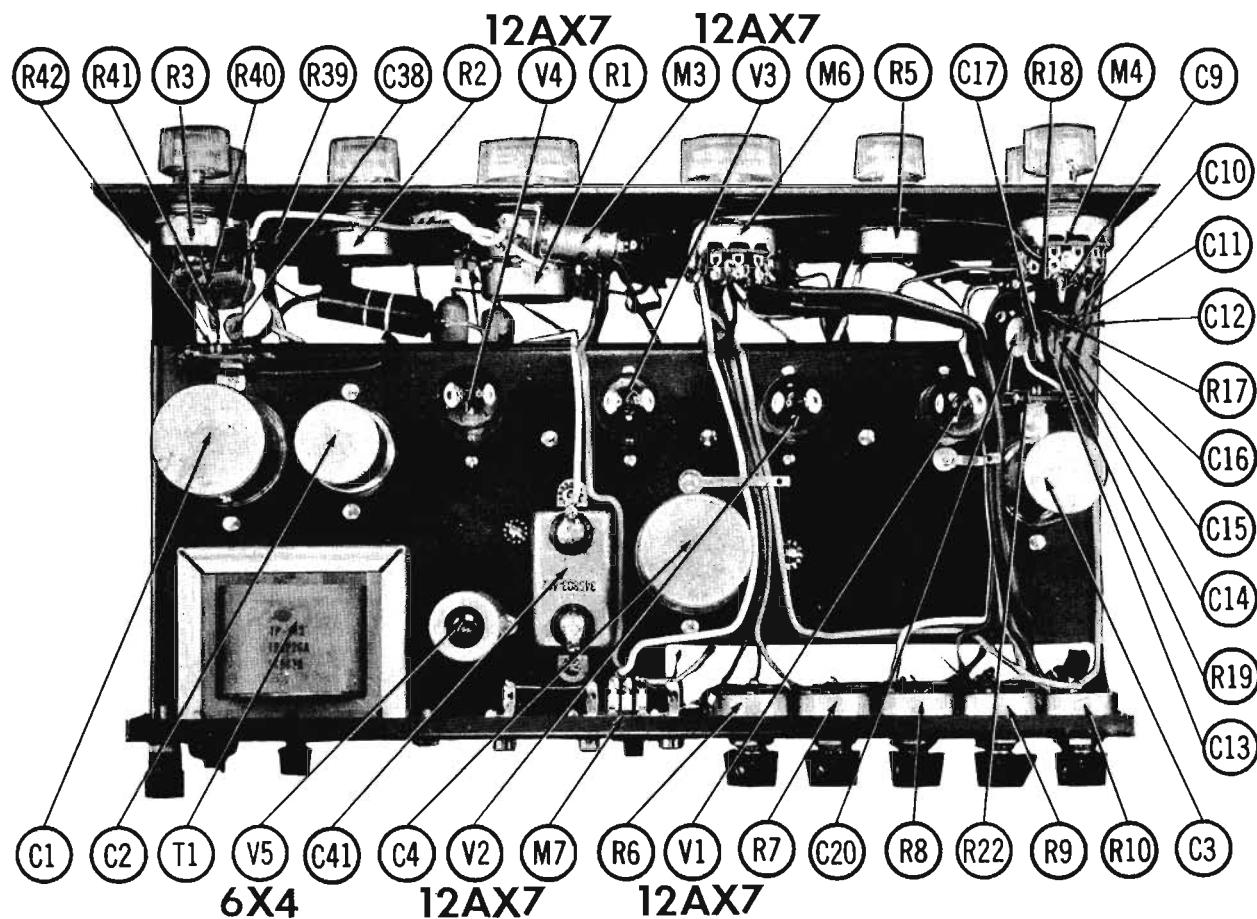
† MEASURED FROM PIN 7 OF V5

- ▲ MEASURED FROM PIN 8 OF V2
- NC NO CONNECTION

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 of component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION





CHASSIS TOP VIEW

## **PARTS LIST AND DESCRIPTIONS**

### **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES
V1	Phono Preamplifier	12AX7	
V2	AF Amp. -Cath. Follower	12AX7	
V3	AF Amplifier	12AX7	

ITEM No.	USE	TYPE	NOTES
V4	AF Amp.-Cath. Follower	12AX7	
V5	Rectifier	6X4	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	GROMMETS PART No.	AEROVOX PART No.	CORNELL DUBLIURE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAUKE PART No.
C1A	±40	400		AFH4-17-48	B0420			D-400	
B	±30	350			B01045			M7-4530	
C	±10	300							
C2A	±10	350		AFH2-47	B0370	FP231	TMD-47	D-200	TVL-2750
B	±10	350							
C3A	±10	350		AFH2-47	B0370	FP231	TMD-47	D-200	TVL-2750
B	±10	350							
C4A	±600	25			BR5002	WD085	TD-500-25	M7H-2550	TVL-2233
B	±500	25			BR5002	TC2505	TD-500-25	M7H-2550	

## **FIXED CAPACITORS**

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

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

### **CONTROLS**

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST- ANCE	WATTS	GROMMETS PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A B	600K	1/2	LC2X500X			Q18-133XX		Loudness, Tap® 100K & 200V
B	500K	1/2				M11-133		Volume
R2A B	2Meg	1/2	LFBC2M	B-76	A47-2Meg-Z	Q13-139	U56	Treble
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	Bass
R3A B	1Meg	1/2	GTC-1M	B-69	A47-1Meg-S	Q11-137	U54	Presence
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	Input Level AUX.
R4A B	1Meg	1/2	GTC-1M	B-69	A47-1Meg-S	Q11-137	U54	Input Level Tuner
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	Input Level Tape Amp.
R5A B	60K	1/2	PC50K	B-34	A47-75K-V	Q14-123	U34	Input Level Mag. Phone #1
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	Input Level Phone #2
R6A B	600K	1/2	VC500K	B-69	A47-500K-Z	Q13-133	U48	
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	
R7A B	500K	1/2	VC600K	B-69	A47-500K-Z	Q13-133	U46	
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	
R8A B	600K	1/2	VC500K	B-69	A47-500K-Z	Q13-133	U48	
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	
R9A B	600K	1/2	VC500K	B-69	A47-500K-Z	Q13-133	U48	
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	
R10A B	500K	1/2	VC500K	B-69	A47-500K-Z	Q13-133	U46	
B	Shunt			Not Req.	R8-2	Not Req.	Not Req.	

## **RESISTORS**

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

Note 1. Low noise deposited carbon resistor.

### **TRANSFORMER (POWER)**

ITEM No.	RATING				REPLACEMENT DATA					
	PRI	SEC. 1	SEC. 2	SEC. 3	GROMMETS PART No.	Halderson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Tried PART No.
T1	117VAC (@ .25A)	840VCTC (@ .00A)	6.3VAC (@ .8A)	23VAC (@ .30A)	TP-213					

① When C23 is 20000MMF C24 is not used.  
 ② When C25 is 20000MMF C26 is not used.

- ③ When C32 is 20000MMF C33 is not used.
- ④ Not used in some versions.

## PARTS LIST AND DESCRIPTIONS (Continued)

### COILS

ITEM No.	USE	REPLACEMENT DATA				NOTES
		GROMMETS PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Tone Choke					220 Millihenries

### SELENIUM RECTIFIER

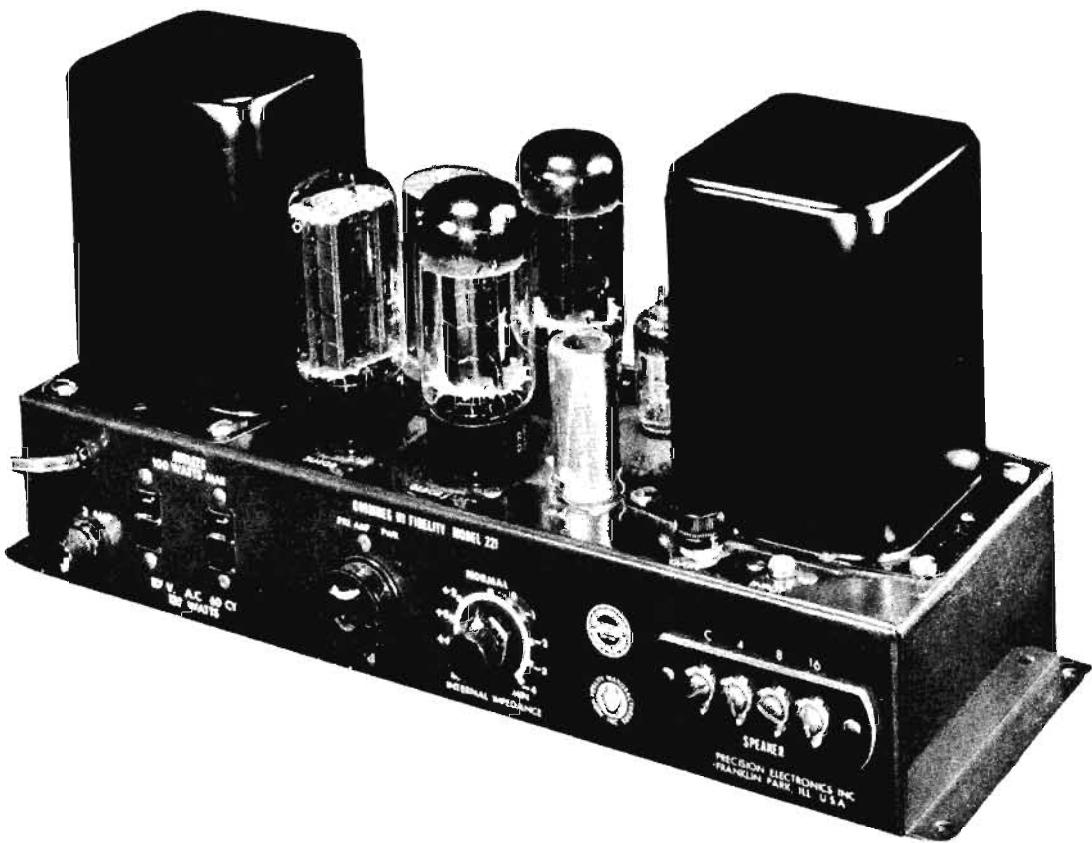
ITEM No.	RATING (Measured)	REPLACEMENT DATA				NOTES
		GROMMETS PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.3A	1017	C1B	604B		

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			GROMMETS PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	SAG	1A 250V			312,500 (SAG 1A 250V)	342001	AGC $\frac{1}{2}$	BXP

### MISCELLANEOUS

ITEM No.	PART NAME	GROMMETS PART No.	NOTES
M3	Pilot Lamp		#51
M4	Switch		Roll-off DB (Rotary Wafer Type)
M5	Switch		Turnover CPS (Rotary Wafer Type)
M6	Switch		Input Selector (Rotary Wafer Type)
M7	Switch		Tap Monitor (Slide Type SPDT)
M8	Switch		Rumble Filter (Slide Type SPDT)
M9	Switch		Presence (Slide Type SPDT)
M10	Switch		Loudness (Slide Type DPST)
M11	Switch		Low Freq. (Slide Type SPDT)
M12	Switch		Power On-Off (Slide Type SPDT)



**GROMMES  
MODELS 221**

TRADE NAME	Grommes Model 221	
MANUFACTURER	Precision Electronics, Inc. 9101 King Ave., Franklin Park, Ill.	
TYPE SET	AC Operated Audio Amplifier	
TUBES (Five)	Types 12AU7 AF Amplifier, 12AU7 AF Amp. - Phase Inv., (2) 6L6GB (or) 5881 Output, 5U4GB Rectifier	
POWER SUPPLY	110-120 Volts AC - 60 Cycles	RATING .9 Amp. @ 117 Volts AC (9 Watts)

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

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# **PARTS LIST AND DESCRIPTIONS**

## **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	I2AU7	
V2	AF Amp - Phase Inv.	I2AU7	
V3	Output	6L6QB	Note 1

ITEM No.	USE	TYPE	NOTES
V4	Output Rectifier	6L06B	Note 1
V5		5U4GB	

Note 1. Some versions may use type 5881.

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	GROMMETS PART No.	AEROVOX PART No.	CORNELL- DUBLIPLIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	#40	450		AFB3-50-05	C0372	FP396.1	TMQ-12	Q-040	TVL-3042
B	■#20	450							
	■#20	600							
C2	10	250		PRB350V10	BR1045	TC52	TD-10-250	MT-4510	IVB-1504
C3	50	50		PRB50V50	BR505	TC39	TD-50-50	MT-0550	IVB-1508

## **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	GROMMETS PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL- DUBLIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4 .22 200 P268N-22 BPD-0025 DD-251 CUB2P22 L10T25 ED-250 GEM-2022 2TM-P22	C5 .250 P288N-22 DD-251 CUB2P22 L10T25 ED-250 UK-3252 5GA-T25	C6 .22 200 P488N-1 DF-104 CUB4P1 CUB4P1 ED-250 GEM-2022 2TM-P22	.1 400 P488N-1 DF-104 CUB4P1 CUB4P1 ED-250 GEM-40L 4TM-PI	C8 .1 400 NPO-31 20 D6-200 L1Q2 ED-30 GEM-40L 4TM-PI	C9 20					10%

## **CONTROLS**

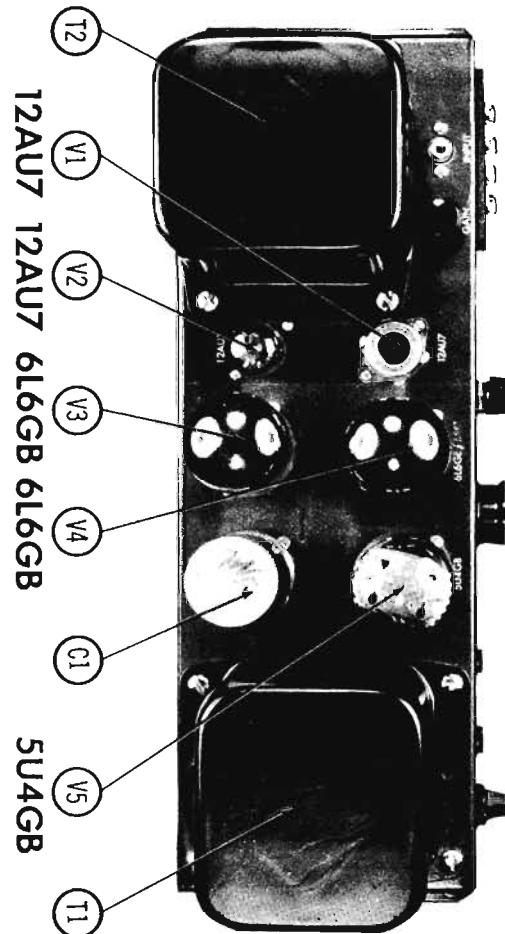
ITEM No.	REPLACEMENT DATA					INSTALLATION NOTES		
	RATING		GROMMETS PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MAILORY PART No.	
R1A B	500K B Shaft	½	VC500X	B-80 Not Req.	A47-500-K-Z RS-2	Q13-133 Not Req.	U48 Not Req.	Gain
R2A B	1Ω	4						Damping (Wire Wound)
	1Ω	4						Damping (Wire Wound)

## **RESISTORS**

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

ITEM No.	RATING		REPLACEMENT DATA			ITEM No.	RATING		REPLACEMENT DATA			ITEM No.
	OHMS	WATT	GROMMETS PART No.	IRC PART No.	NOTES		OHMS	WATT	GROMMETS PART No.	IRC PART No.	NOTES	
R3	1Meg		BTS-1Meg			R12	80K					BTA-58K
R4	22K		BTA-22K			R13	22K					BTD-22K
R5	100K		BTA-100K			R14	1000K					BTS-1000
R6	100K		BTS-100K			R15	100K					BTS-100K
R7	1000K		BTS-1000			R16	1000K					BTS-1000
R8	22K		BTS-22K			R17	100K					BTS-100K
R9	2200Ω		BTS-2200			R18	10K					BTG-100K
R10	1Meg		BTS-1Meg			R19	22K					BTS-22K
R11	47K	1	BTA-47K			R20	22K					BTD-22K
						R21	10K					BTA-10K

## **CHASSIS—TOP VIEW**



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	GROMMETS PART No.	Hallderson PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Triad PART No.
T1	117VAC .9A	780VCT .10A	5VAC .3A	6.3VCT .2.5A	TP5UA				25R08	B5M-207 ①

① Drill new mounting holes.

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	GROMMETS PART No.	Hallderson PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Triad PART No.	
T2	6900Ω CT	16Ω Tap② 8Ω, 4Ω	T022	H41U	A-3102		22539	B5M-186 ①	① Drill new mounting holes.

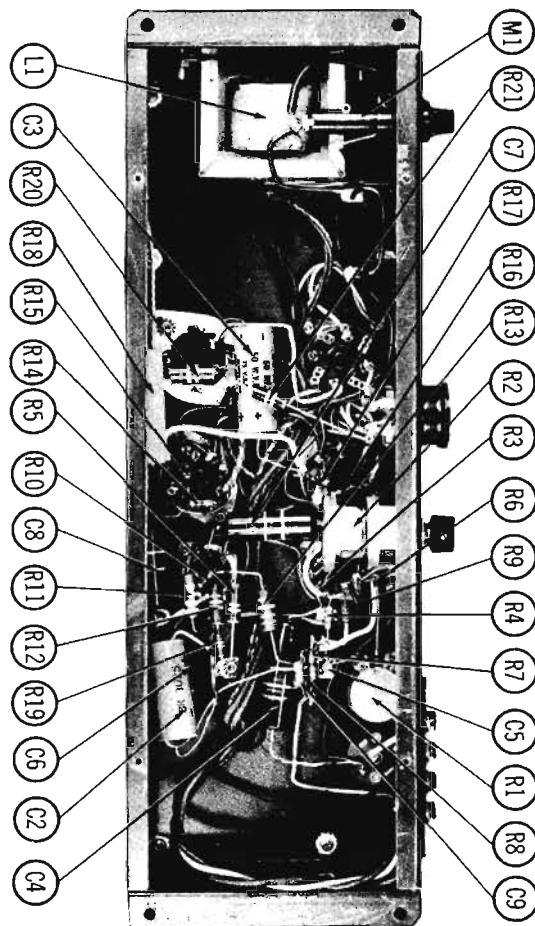
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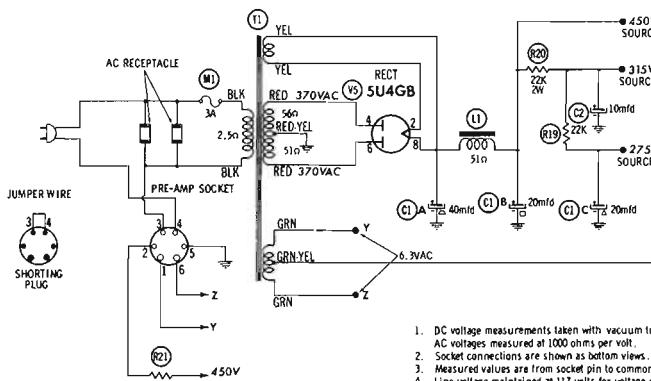
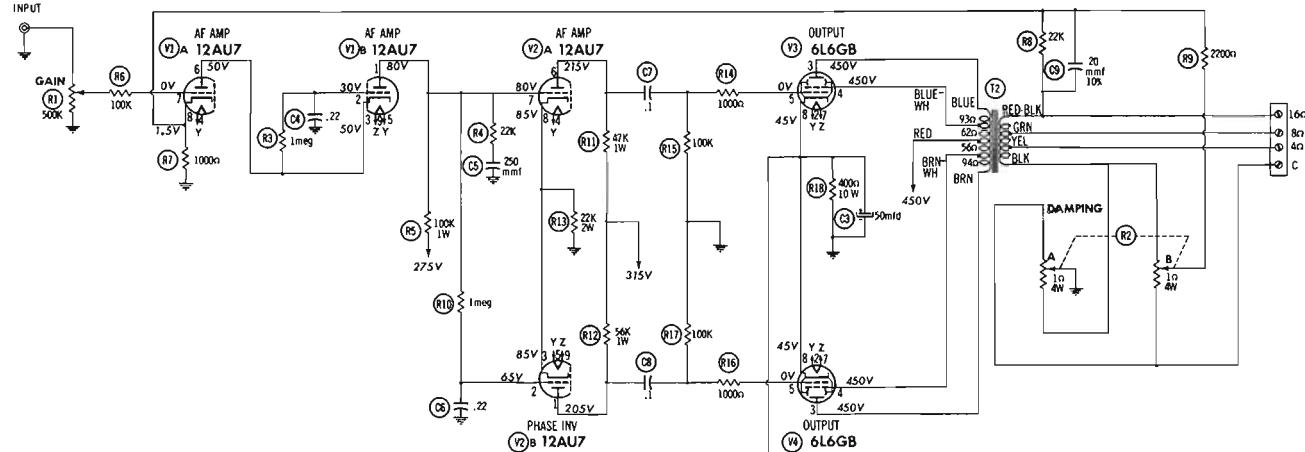
ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (D CURRENT 1000 Ω)	GROMMETS PART No.	Hallderson PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Triad PART No.
L1	.110A	5Ω	22H	C82	C5028	C-2974	C-2304	28C43	C-23X

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			GROMMETS PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	3A			312003, (3AG-3A)	342001	AGC3	HCM

## CHASSIS—BOTTOM VIEW





RESISTANCE READINGS								
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AU7	t 145K	INF	INF	400n	400n	INF	100K
V2	12AU7	t 78K	t 1.1Meg	22K	400n	400n	t 69K	t 145K
V3	6L6GB	TP	400n	t 205n	t 110n	100K	TP	400n
V4	6L6GB	TP	400n	t 200n	t 105n	100K	TP	400n
V5	5U4GB	NC	20K(Min)	NC	50n	NC	51n	20K(Min)

t MEASURED FROM PIN 2 OF V5  
TP TIE POINT  
NC NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter.
2. AC voltages measured at 1000 ohms per volt.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance of component values makes possible a variation of +15% in voltage and resistance readings.
7. All controls at minimum, proper output load connected.

**PHOTOFAC<sup>\*</sup> Folder**



**HAMILTON  
MODEL PMX-6**



**HAMILTON  
MODEL PMX-6**

TRADE NAME	Hamilton Model PMX-6	
MANUFACTURER	Hamilton Electronics Corp., 2726 W. Pratt Ave., Chicago 45, Ill.	
TYPE SET	AC Operated 6 Channel Preamplifier Mixer	
TUBES (Three)	Types 12AX7 Channels 1-2 Preamplifier, 12AX7 Channels 3-4 Preamplifier, 12AX7 Channels 5-6 Preamplifier	
POWER SUPPLY	110-120 Volts AC - 60 Cycles	RATING .04 Amp. @ 117 Volts AC ( 5 Watts)

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Channel 1-2 Preamp.	12AX7	
V2	Channel 3-4 Preamp.	12AX7	

ITEM No.	USE	TYPE	NOTES
V3	Channel 5-6 Preamp.	12AX7	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	HAMILTON PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	±40	150	(Note 1)	AFB13-09	CO080	FP31L 4	TMT-8	T-040	TVL-3438
B	±30	150							
C	20	150							

Note 1: Some versions may use 20-20-20MFD unit in this application.

### FIXED CAPACITORS

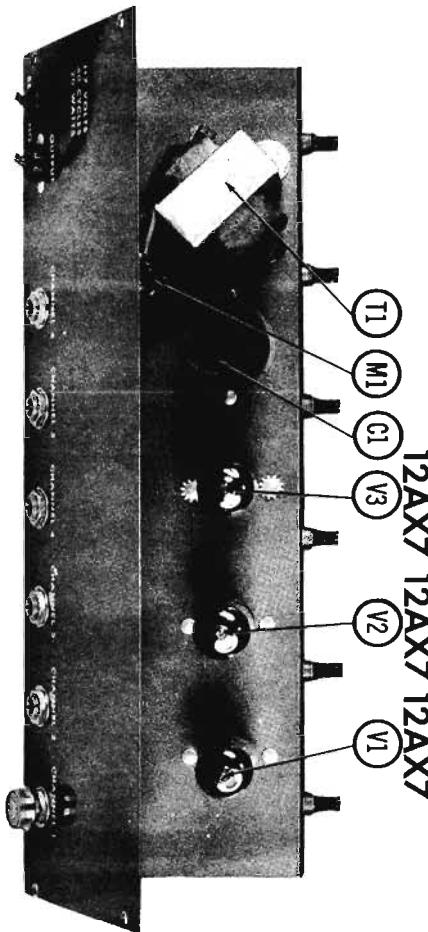
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	HAMILTON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	10000			HPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	
C3	10000			BPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	
C4	10000			BPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	
C5	10000			BPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	
C6	10000			BPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	
C7	10000			BPD-01	DD-103	BYA-851	ED-01	DC511	SHK-S1	

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	HAMILTON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 1 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
R2A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 2 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
R3A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 3 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
R4A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 4 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
R5A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 5 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
R6A	500K	1		B-60	A47-500K-Z	Q13-133	U16	Channel 6 Volume
B	Shaft				KSB-3	Not Req.	Not Req.	
C	Switch		KB-1		SWB-12	76-1	US-26	

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA		
	OHMS	WATT	HAMILTON PART No.	IRC PART No.	NOTES
R7	470K		BTS-470K		
R8	100K		BTS-100K		
R9	150K		BTS-150K		
R10	470K		BTS-470K		
R11	100K		BTS-100K		
R12	150K		BTS-150K		
R13	470K		BTS-470K		
R14	100K		BTS-100K		
R15	150K		BTS-150K		
R16	470K		BTS-470K		
R17	100K		BTS-100K		

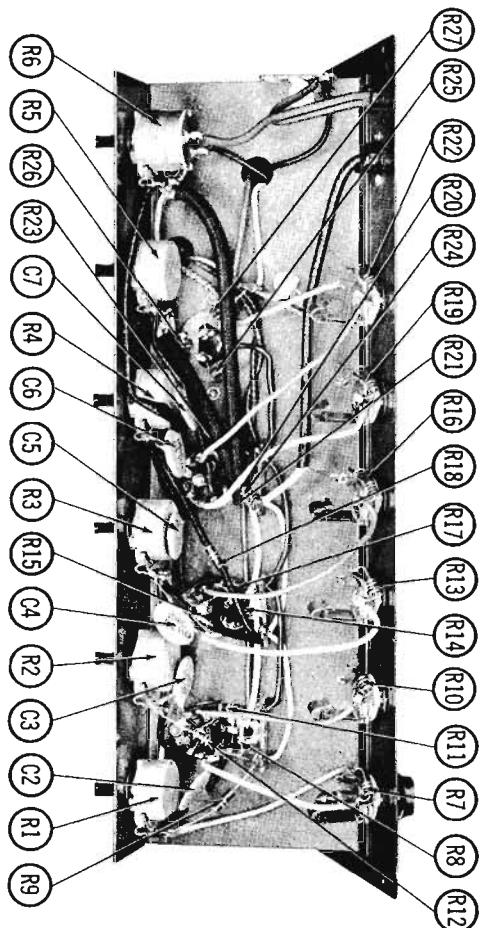
### TRANSFORMER (POWER)

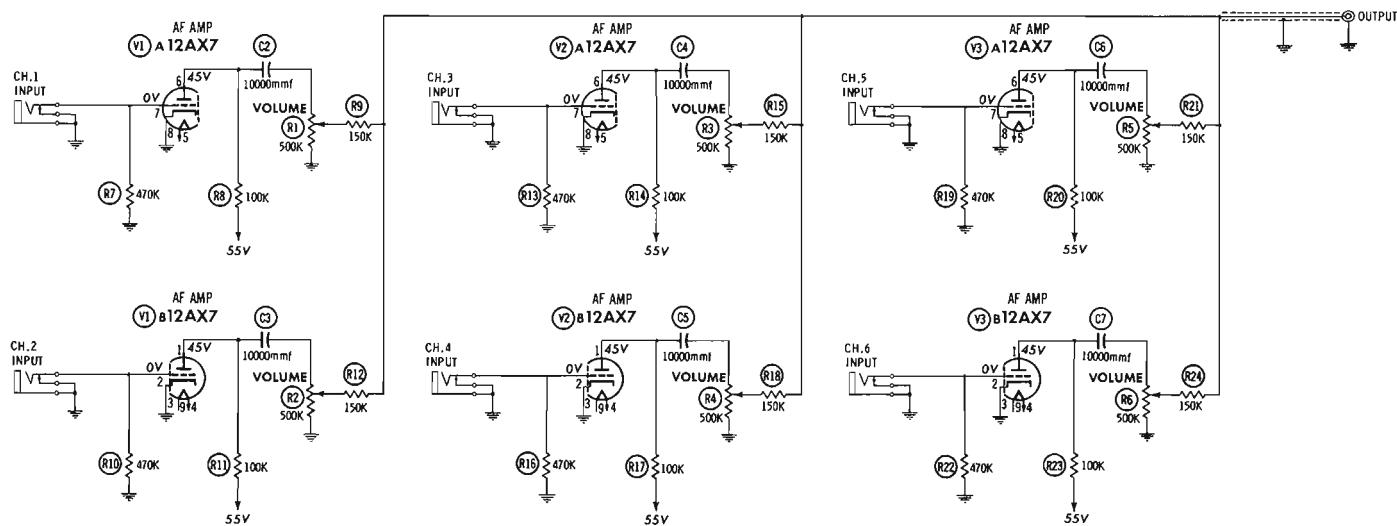
ITEM No.	RATING			REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	HAMILTON PART No.	Holldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .04A	150VAC @ .0012A	8VCT @ .34A	33GA07		P-3048		20H32	

### SELENIUM RECTIFIER

ITEM No.	REPLACEMENT DATA						
	RATING	HAMILTON PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.
M1	CURRENT (Measured) .0012A	1386	R8050	8875	8Z1	50	

## CHASSIS—BOTTOM VIEW



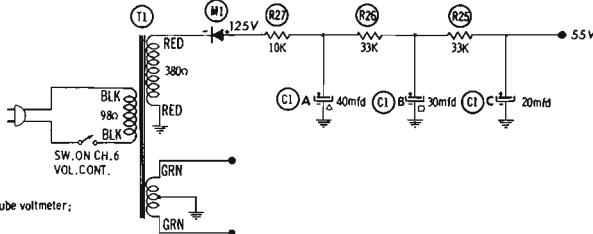


## RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	1175K	0Ω	0Ω	.9Ω	.9Ω	† 175K	0Ω	0Ω	.5Ω
V2	12AX7	1175K	0Ω	0Ω	.9Ω	.9Ω	† 175K	0Ω	0Ω	.5Ω
V3	12AX7	1175K	0Ω	0Ω	.9Ω	.9Ω	† 175K	0Ω	0Ω	.5Ω

† MEASURED FROM OUTPUT OF M1.

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 of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.





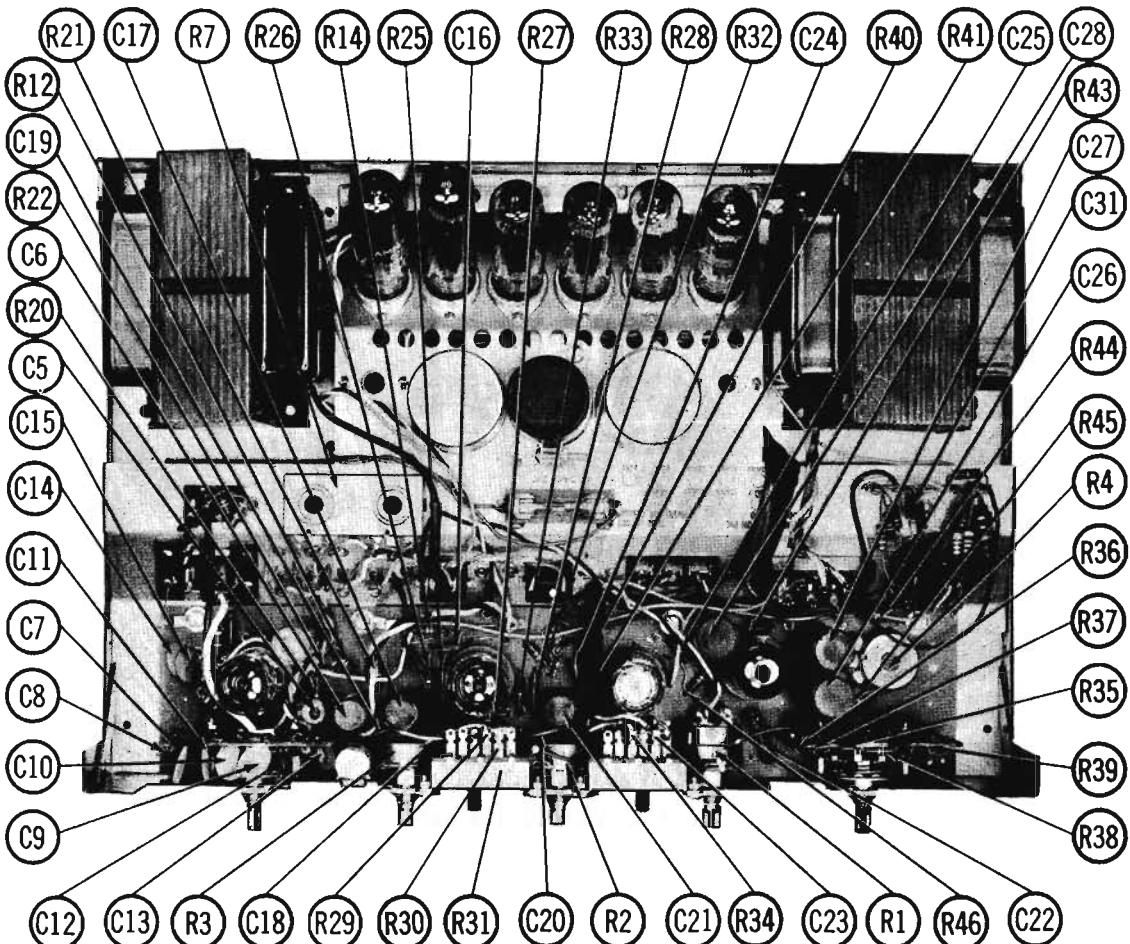
HARMAN-KARDON  
MODEL A-1040 "Trend II"

TRADE NAME	Harman-Kardon Model A-1040 "Trend II"
MANUFACTURER	Harman-Kardon, Inc., 520 Main St., Westbury, L.I., N.Y.
TYPE SET	AC Operated 6 Channel 40 Watt Audio Amplifier
TUBES (Ten)	Types 12AX7 Phono Preamplifier, 12AX7 Cath. Follower-AF Amp., 12AV6 AF Amplifier, 12AT7 AF Amp-Phase Inv., (4) 12AB5 Output, (2) EZ81 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycles      RATING .83 Amp. @117 Volts AC (84 Watts)

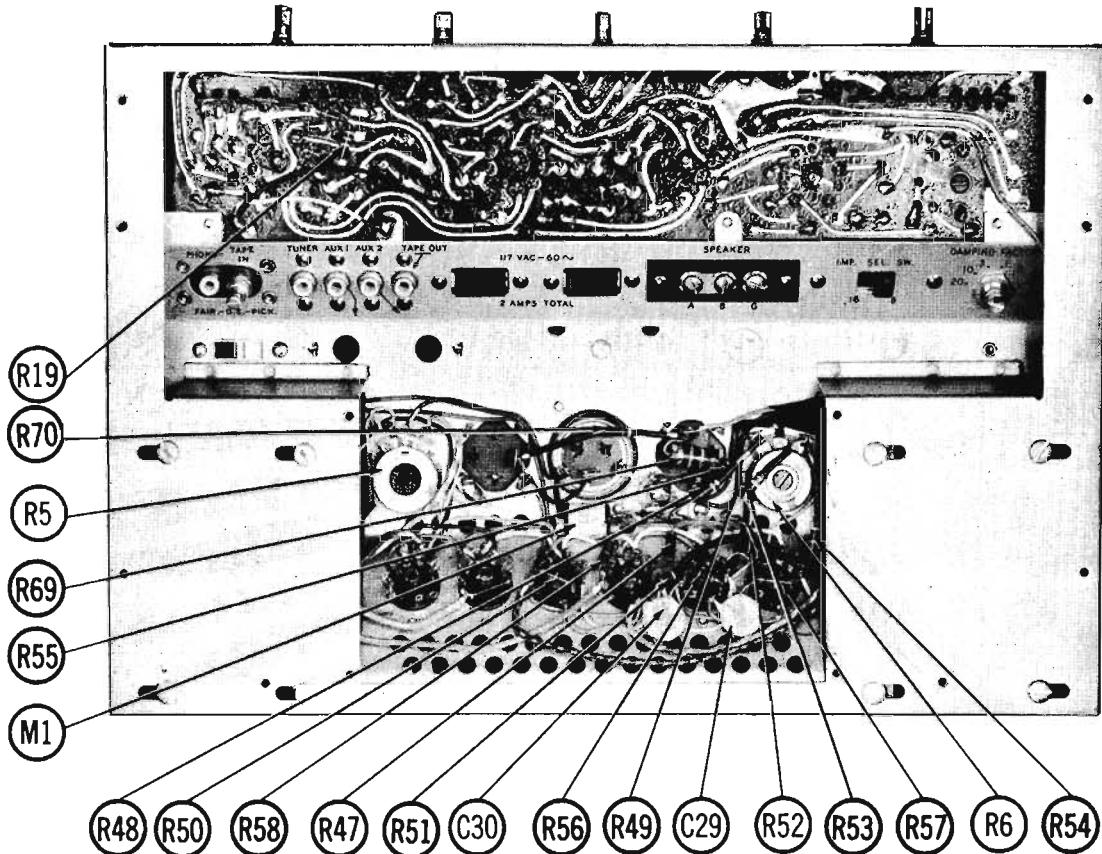
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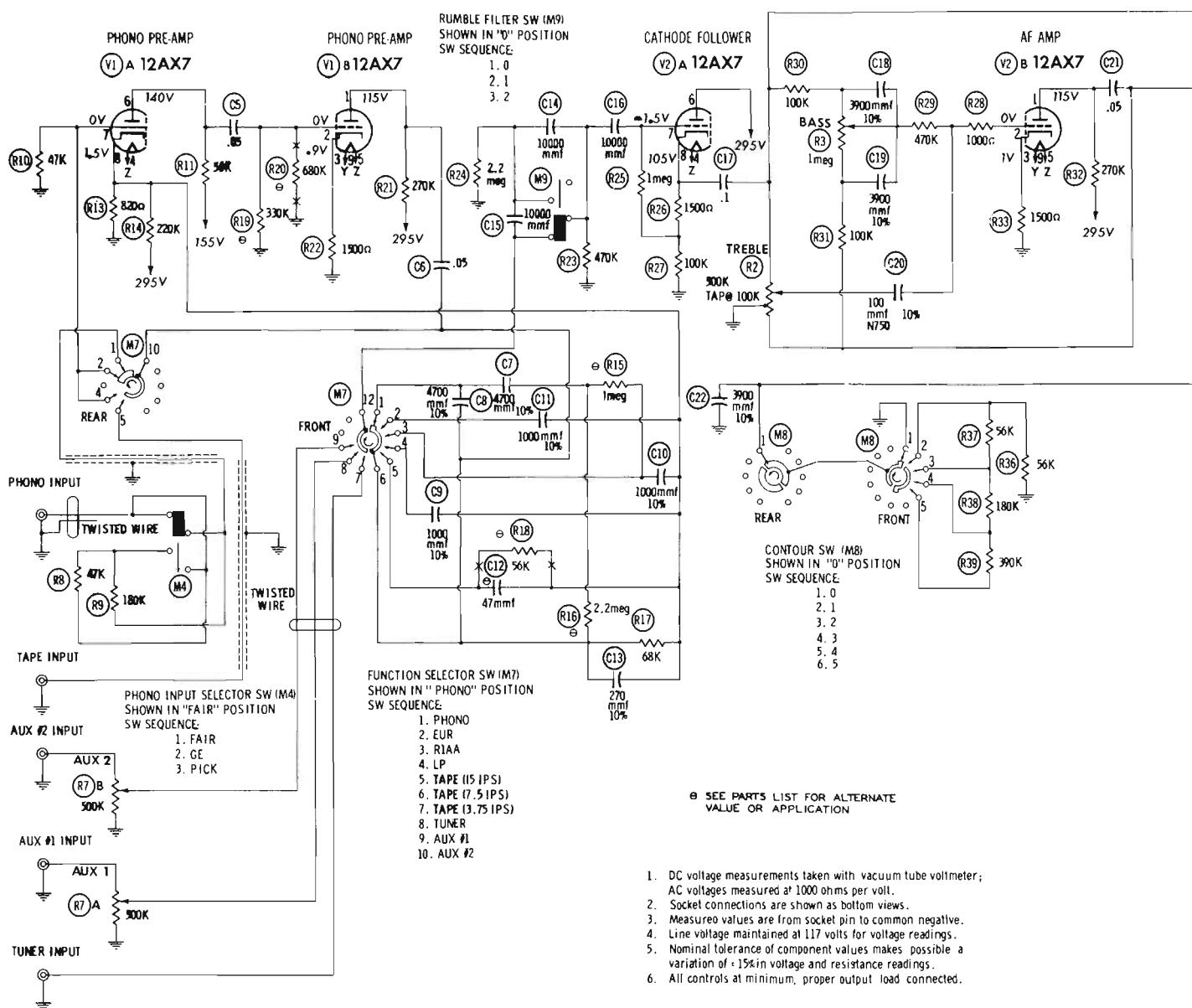
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CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW



- 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 of component values makes possible a variation of ±15% in voltage and resistance readings.
- All controls at minimum, proper output load connected.

#### RESISTANCE READINGS

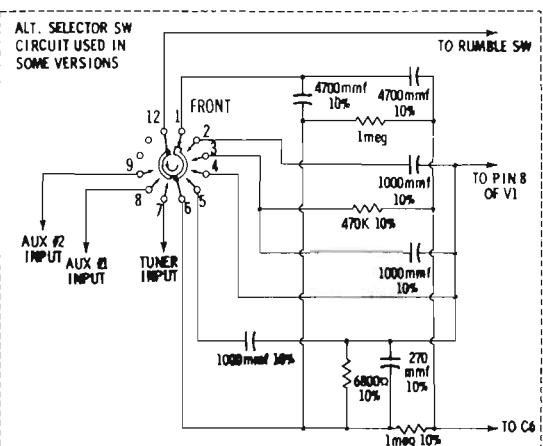
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	1300K	220K	1500Ω	37K	37K	1270K	47K	820Ω	37K
V2	12AX7	1300K	600K	1500Ω	37K	37K	132K	1.1meg	100K	37K
V3	12AV6	470K	1100Ω	37K	37K	NC	NC	1500K		
V4	12AT7	160K	1500Ω	27K	37K	37K	160K	11.5meg	27K	37K
V5	12AB5	1000Ω	TP	165K	37K	37K	165K	0Ω	1000Ω	100Ω
V6	12AB5	1000Ω	TP	165K	37K	37K	165K	0Ω	1000Ω	100Ω
V7	12AB5	1000Ω	TP	165K	37K	37K	165K	0Ω	1000Ω	100Ω
V8	12AB5	1000Ω	TP	165K	37K	37K	165K	0Ω	1000Ω	100Ω
V9	EZ81	90Ω	NC	20K(min)	37K	37K	NC	90Ω	NC	NC
V10	EZ81	81Ω	NC	20K(min)	37K	37K	NC	81Ω	NC	NC

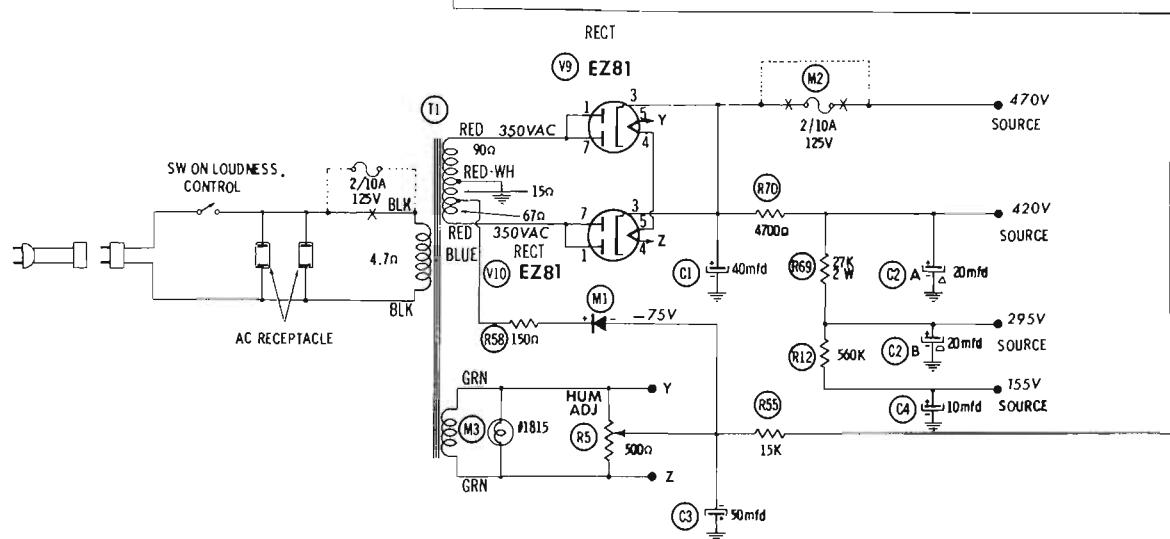
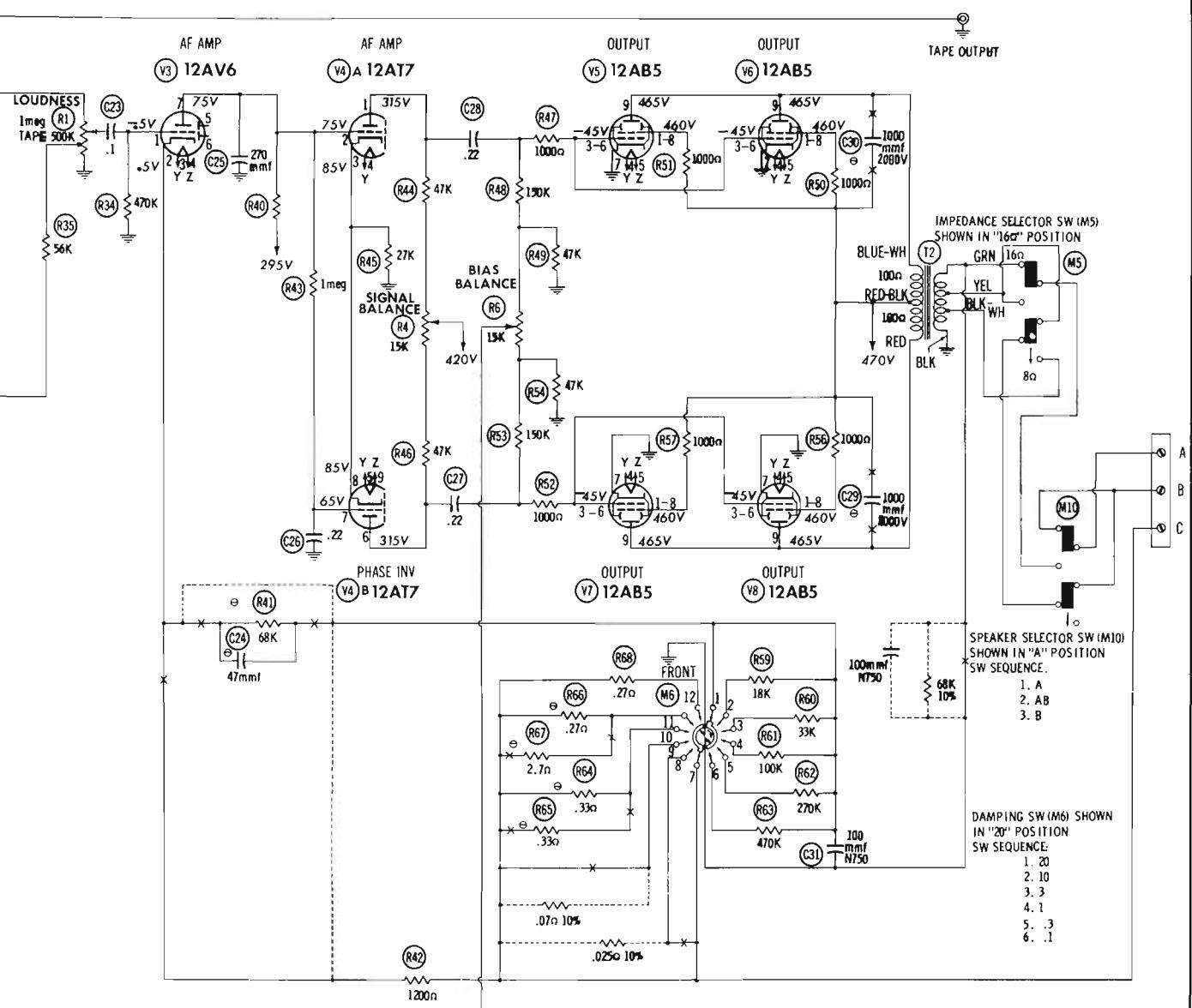
1 MEASURED FROM PIN 3 OF V10

2 MEASURED FROM PIN 8 OF V2

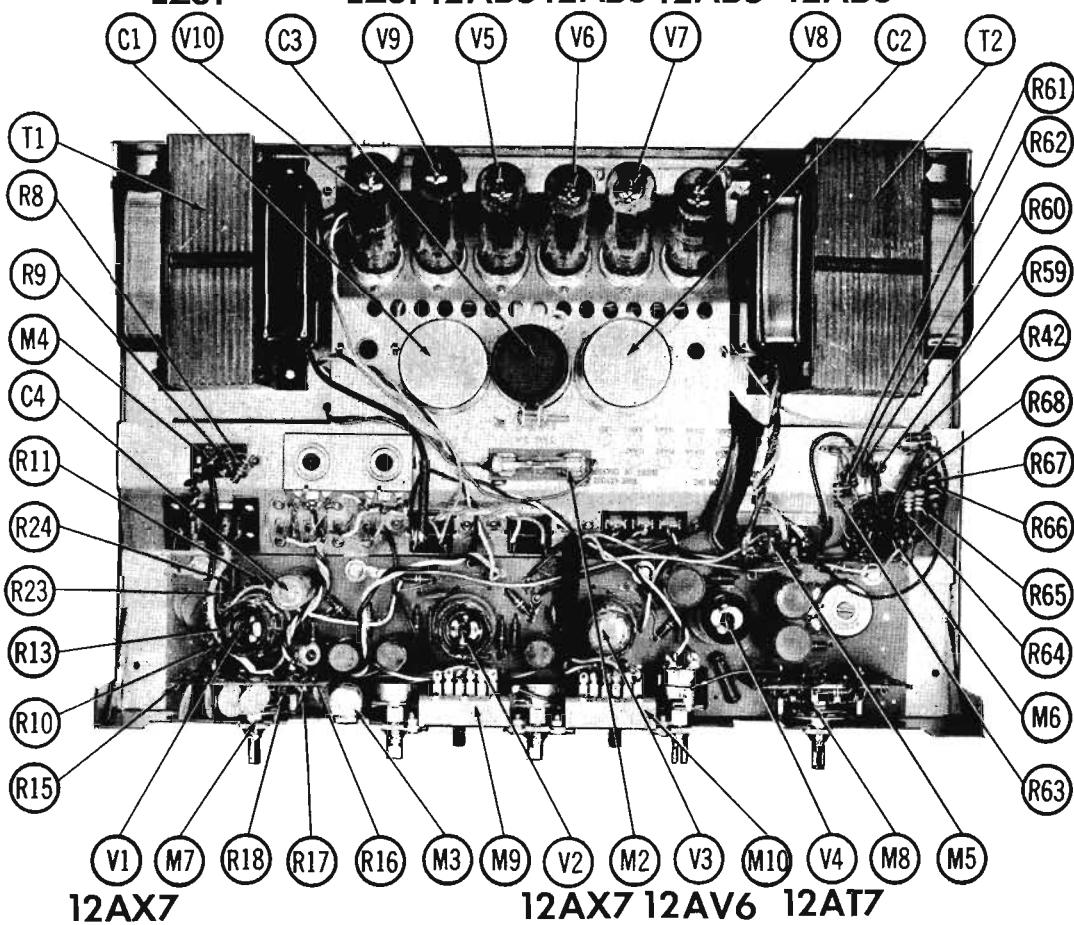
NC NO CONNECTION

TP TIE POINT





**EZ81 12AB5 12AB5 12AB5 12AB5 12AB5**



**CHASSIS-TOP VIEW**

# **PARTS LIST AND DESCRIPTIONS**

## **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES
V1	Phono Preamplifier	12AX7	
V2	Cath. Follower-AF Amp.	12AX7	
V3	AF Amplifier	12AV6	
V4	AF Amplifier-Phase Inv.	12AT7	
V5	Output Stage	12AD4	

ITEM No.	USE	TYPE	NOTES
V6	Output	I2A85	
V7	Output	I2A85	
V8	Output	I2A85	
V9	Rectifier	EZ81	
V10	Rectifier	EZ81	

#### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOL.	HARMAN-KARDON PART No.	AEBVOX PART No.	CORNEIL- DUBLIUM PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	475	JE1017139	AFH1-56-10	A0516	FPI284	TMD-61	S-300	TVL-1820
B	20	475	JE1017140	AFH2-69	B0500		TMD-61	D-270	TVL-2935
C3	30	150							
C4	10	150	JE1021711	AFH1-18	A0200	FPI15	TMB-20	S-080	TVL-1415
					BRB10V150	TC42	TD-10-150	MT-1510	TVL-1408

## 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		Harman-Kardon PART No.	AEROVOX PART No.	CENTRALAB PART No.	REPLACEMENT DATA					NOTES
	CAP.	VOLT				CORNELL- DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.		
C6 .05 200			P288N-05	DF-503	CUB285 BC8547J	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	2T-M-S5 ACE-847	
C8 .05 400					IRSD47	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	MS-247 MS-247	10%
C7 4700					IRSD47	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	MS-21	10%
C9 1000					IRSD47	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	MS-21	10%
C10 1000					IRSD47	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	MS-21	10%
C11 1000					IRSD47	ED-1000	MC82355 ED-1000	MC82355 ED-1000	MC82355 ED-1000	MS-21	10%
C12 47			BPD-000047	DD-470	L1Q047	ED-47	UO-5447	SQA-Q47	SQA-Q47		①
C13 270			NPO-S1270	DD-271	RS5727	ED-270	DCSII	SHK-S1	SHK-S1		
C14 10000			BPD-01	DD-103	BVAAS1	ED-01	DCSII	SHK-S1	SHK-S1		
C15 100000			BPD-01	DD-103	BVAAS1	ED-01	DCSII	SHK-S1	SHK-S1		
C16 10000			BPD-01	DD-103	BVAAS1	ED-01	DCSII	SHK-S1	SHK-S1		
C17 .1 200					BC2P1J		ACE400	ZSE-P10	ZSE-P10		
C18 .1 200					IRSD39		MS-239	MS-239	MS-239		10%
C19 3000					IRSD39		MS-239	MS-239	MS-239		10%
C20 100					IRSD39		MS-239	MS-239	MS-239		10%
C21 .05 400			N750-DN100	TCN-100	C101U10	TC7-100	NT-531	STC1-L1	STC1-L1		
C22 3900					BC8547J		ACE815	4SE-847	4SE-847		
C23 .1 200					IRSD39			MS-239	MS-239		
C24 47			BPD-000047	DD-470	BC2P1J	ED-47	ACE401	ZSE-P10	ZSE-P10		
C25 270			S1270	DD-271	L1Q047	ED-47	UO-5447	SQA-Q47	SQA-Q47		①
C26 .22 400					LT8727	GP-270	UO-5447	UO-5447	UO-5447		
C27 .22 400					BC6F22J		UO-5447	UO-5447	UO-5447		
C28 .22 400					BC6F22J		UO-5447	UO-5447	UO-5447		
C29 10000			HVD-30-1000	DD10-100	HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C30 10000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C31 1000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C32 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C33 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C34 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C35 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C36 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C37 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C38 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C39 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C40 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C41 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C42 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C43 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C44 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C45 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C46 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C47 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C48 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C49 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C50 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C51 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C52 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C53 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C54 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C55 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C56 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C57 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C58 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C59 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C60 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C61 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C62 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C63 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C64 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C65 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C66 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C67 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C68 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C69 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C70 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C71 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C72 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C73 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C74 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C75 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C76 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C77 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C78 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C79 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C80 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C81 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C82 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C83 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C84 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C85 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C86 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C87 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C88 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C89 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C90 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C91 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C92 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C93 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C94 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C95 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C96 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C97 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C98 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C99 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C100 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C101 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C102 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C103 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C104 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C105 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C106 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C107 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C108 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C109 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C110 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C111 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C112 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C113 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C114 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C115 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C116 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C117 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C118 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C119 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C120 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE6022		
C121 100000					HVD-30-1000	HD-30-1000	ACE6022	ACE6022	ACE		

#### ① Not Used in Some Versions

## **CONTROLS**

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

### **RESISTORS**

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

ITEM No.	RATING		Harman- Kardon PART No.	NOTES	ITEM No.	RATING		Harman- Kardon PART No.	NOTES
	OHMS	WATT				OHMS	WATT		
R0	47K				R40	470K			
R0	160K				R41	68K			
R0	47K				R42	2000Ω			
R11	56K				R43	1meg			Note 3
R12	580K				R44	47K			
R13	820K				R45	27K			
R14	220K				R46	47K			
R15	1meg			Note 1	R47	1000Ω			
R16	2.2meg			Note 2	R48	100K			
R17	68K				R49	47K			
R18	56K			Note 3	R50	1000Ω			
R19	330K			Note 4	R51	1000Ω			
R20	680K			Note 3	R52	1000Ω			
R21	270K				R53	150K			
R22	1500Ω				R54	47K			
R23	47K				R55	15K			
R24	2.2meg				R56	100Ω			
R25	1meg				R57	1000Ω			
R26	1500Ω				R58	150Ω			
R27	100K				R59	18K			
R28	100K				R60	33K			
R29	470K				R61	100K			
R30	10K				R62	270K			
R31	100K				R63	100Ω			
R32	270K				R64	0.33Ω			
R33	1500Ω				R65	0.33Ω			Note 5
R34	470K				R66	0.27Ω			Note 3
R35	56K				R67	2.7Ω			Note 6
R36	56K				R68	0.27Ω			Note 3
R37	56K				R69	2.7Ω	2		
R38	180K				R70	1700Ω			

- Note 1. Some versions may use 470K in this application
- Note 2. Some versions may use 1meg in this application
- Note 3. Not used in some versions
- Note 4. Some versions may use 220K in this application
- Note 5. Some versions may use 0.18n in this application
- Note 6. Some versions may use 0.24n in this application

### **TRANSFORMER (POWER)**

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Harman-Kardon PART No.	Halldorson PART No.	Merit PART No.	Stoncor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ② .85A	720V CT ③ .074A	12V ② 2.6A		FT1071720					

#### **TRANSFORMER (AUDIO OUTPUT)**

TRANSFORMER (AUDIO OUT)									
ITEM No.	IMPEDANCE	REPLACEMENT DATA							NOTES
		HARZBERG PART No.	Hallidorson PART No.	Merit PART No.	Stonar PART No.	Thordarson PART No.	Triod PART No.		
		PRL SEC.							
T2	4400Ω 16Ω CT TAP (R)	FT1071730				22878	①	① Use Orig. Shields Do Not Use 250Ω, 500Ω Tape	

## PARTS LIST AND DESCRIPTIONS (Continued)

### RECTIFIERS

ITEM No.	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	Harman-Kardon PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.002A	Z1021726	1159	CR20	1D	

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Harman-Kardon PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	2/10A 125V S/B			313.200 (3AG 2/10A 125V S/B)	357001	MDL 2/10	4405

### MISCELLANEOUS

ITEM No.	PART NAME	Harman-Kardon PART No.	NOTES
M3	Pilot Lamp	KBL021741	#1815
M4	Switch		Fair.-GE-Pick (Slide Type SPDT)
M5	Switch		Impedance Selector (Slide Type SPST)
M6	Switch	ER371057	Damping Potentiometer (Wafer Type)
M7	Switch	ER1021633	Decade (Rotary Wafer Type)
M8	Switch	ER1021632	Contour (Rotary Wafer Type)
M9	Switch		Rumble Filter (Slide Type DPST)
M10	Switch	ESB1021717	Speaker (Slide Type DPST)

### 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. 1785-B (6 Ft. Length) 1725-K (7 1/2 Ft. Length)
Low-Loss Shielded Lead (Interconnecting).....	Use BELDEN No. 0440
Phone Pick-up Arm Cable .....	Use BELDEN No. 8430 (Two Conductor - Twisted)

### CABINETS & CABINET PARTS

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

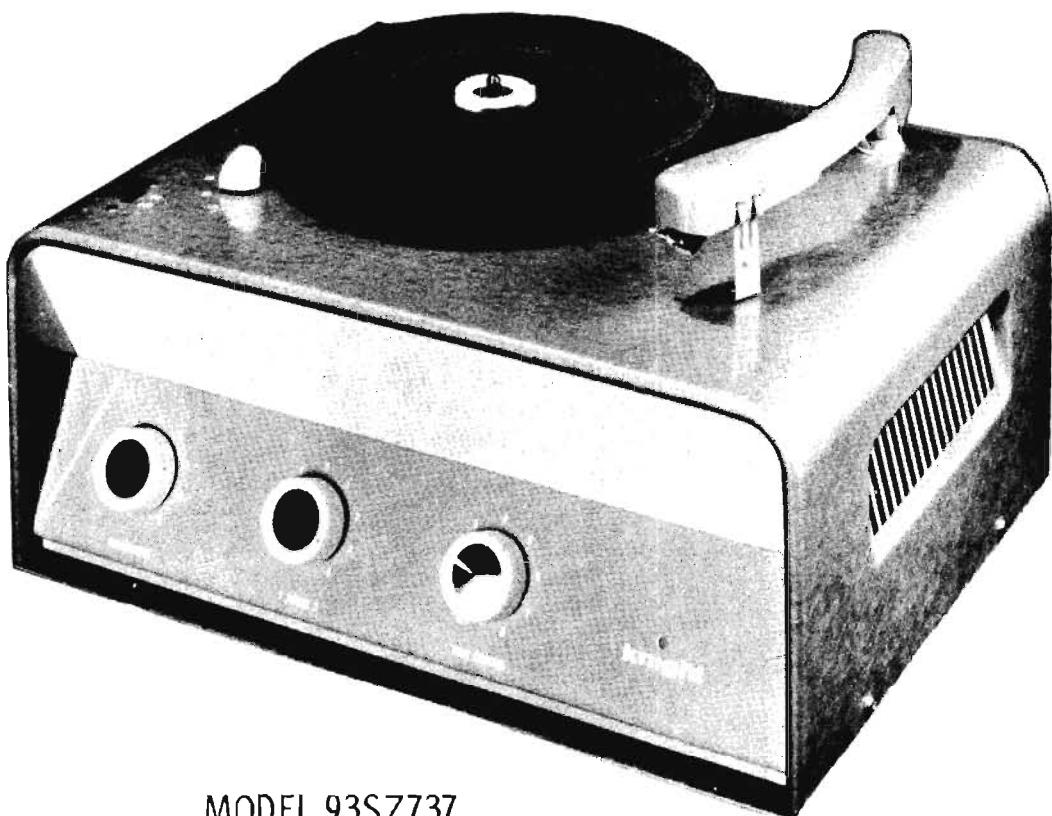
### ADJUSTMENTS

#### BIAS BALANCE ADJUSTMENT (R8)

This control should be adjusted if an output tube (V5, V8, VT, or V8) is replaced. Connect a suitable load (speaker or resistor) across the speaker terminals and allow the amplifier to warm-up. Connect an oscilloscope across the speaker terminals. With volume control at minimum, adjust R8 for a straight line on the screen of the scope. If an oscilloscope is not available, an AC VTVM may be connected across the speaker terminals and R8 adjusted for a minimum reading on the meter. (This should be approximately 1-5 millivolt).

#### SIGNAL BALANCE ADJUSTMENT (R4)

This control should be adjusted if new tubes are installed in the amplifier. The "Bias Balance" control (R8) should be adjusted prior to adjusting R4. Connect an IM analyzer, with a signal ratio of 4:1, to the amplifier. Set volume control for maximum output. Adjust the "Signal Balance" control (R4) for minimum IM.



MODEL 93SZ737

**KNIGHT  
MODELS 93SZ505, 93SZ737**

TRADE NAME	Knight Models 93SZ505, 93SZ737		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois		
TYPE SET	AC Operated 16 Watt 3 Channel Audio Amplifier (Model 93SZ737 Has 4 Speed Manual Record Player)		
TUBES (Five)	Types 6AV6 Mic. Preamplifier, ECC83 (or) 12AD7 (or) 12AX7 AF Amplifier, (2) 6V6GT Output, 5Y3GT Rectifier		
POWER SUPPLY	110-120 Volts AC - 60 Cycles	RATING	.6 Amp. @ 117 Volts AC, 62 Watts

**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 HI170

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Mic. Preamplifier	6AV6 ECC83/ 12AX7	
V2	AF Amplifier	Note 1	

Note 1. Some versions use a 12AD7 in this application.

### 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	450			AFM3-4I	C0320	FP398.2	TMT-36	Q-055
B	.10	450							TVL-3783
C	.10	450							
C2	8	450		PRS450V8	BR845	TC71	TD-8-450	MT-4608	TVA-1704
C3	35	50		PRS150V40	BR505	TC48	TD-40-150	MT-1540	TVA-1308

### 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.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	10000				BPD-01	BYA65	ED-01	DC5U	SHK-31	
C5	10000				BPD-01	BYA65	ED-01	DC5U	SHK-31	10%
C6	500				DD-103	DD-103	ED-01			10%
C7	150				DD-108	DD-108	ED-01			10%
C8	2200				DD-501	DD-501	ED-500			
C9	.047	600		P668N-047	DF-503	CUB6547	GEM-6147	8TM-547		
C10	.047	600		P668N-047	DF-503	CUB6547	GEM-6147	8TM-547		
C11	.047	600		P668N-047	DF-503	CUB6547	GEM-6147	8TM-547		
C12	.047	600		P668N-047	DF-503	CUB8557	GEM-6147	8TM-547		
C13	.02	600		P668N-02	DD-203	CUB652	GEM-612	8TM-52		

### CONTROLS

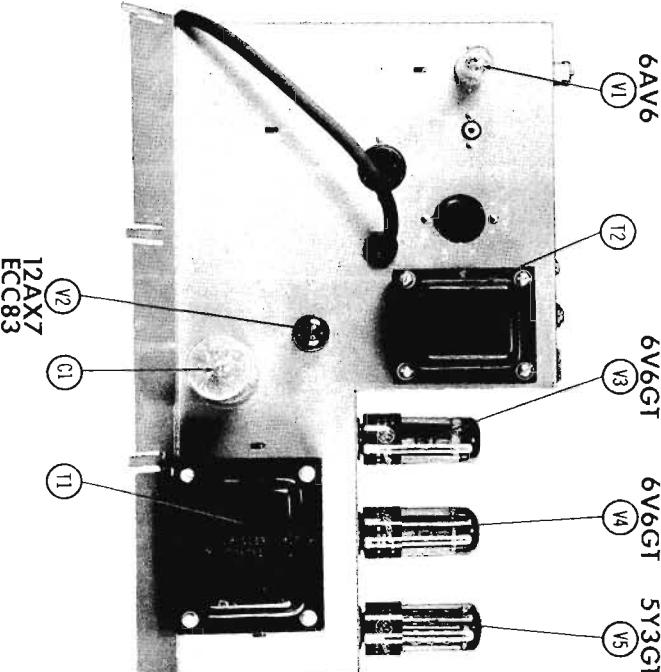
ITEM No.	RATING		REPLACEMENT DATA						INSTALLATION NOTES
	RESISTANCE	WATTS	KNIGHT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	JRC PART No.	MALLORY PART No.		
R1A	1Meg	1/2	R-P-105AC-C	B-70	A47-1Meg-Z	Q13-137	U53		Tone
B	Shaft Switch			Not Req.	X88-3	Not Req.	U53		
C	Switch			KB3-1	SW8-12	76-1	Not Req.		
R2	4Meg		RP-405A	B-70	A47-1Meg-Z	Q13-137	U53		
R3A	1Meg		RP-105A	Not Req.	KSS-3	Not Req.	Not Req.		Phone #1 & #2, Tap @ 2Meg
B	Shaft								Mic. Input

### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	ITEM No.	RATING	KNIGHT PART No.	IRC PART No.	NOTES	ITEM No.	RATING	KNIGHT PART No.	IRC PART No.	
OHMS	WATT	OHMS	WATT		OHMS	WATT	OHMS	WATT		
R4	10Meg	BTS-10Meg	BTS-10Meg			R13	100K		BTS-100K	
H5	470K	BTS-470K	BTS-470K			R14	1000Ω		BTS-1000	
R6	220K	BTS-220K	BTS-220K			R15	100K		BTS-100K	
R7	470K	BTS-470K	BTS-470K			R16	470K		BTS-470K	
R8	470K	BTS-470K	BTS-470K			R17	250Ω	4	PW4-250	
R9	2.00M	BTS-2.00M	BTS-2.00M			R18	470K		BTS-470K	
H10	30K	BTS-30K	BTS-30K			R19	3300Ω	1	BTA-3300	
R11	470K	BTS-470K	BTS-470K			R20	10K		BTS-10K	
R12	470K	BTS-470K	BTS-470K			R21	22K		BTS-22K	

### CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Holldorson PART No.	Morit PART No.	Stancor PART No.	Thordorson PART No.	Triod PART No.
T1	117VAC @ .8A	840VCT @ .076A	5VAC @ 2A	6.3VCT @ 1.6A	LP-0258	P9316	P-2653	PMB410	22R05	R-148

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	KNIGHT PART No.	Holldorson PART No.	Morit PART No.	Stancor PART No.	Thordorson PART No.	
T2	8800Ω CT	500Ω Tap @ 70V, 250Ω, 16Ω, 8Ω, 4Ω	LO-0150					

### PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA			REMARKS	
	KNIGHT PART No.	ASTATIC PART No.	ELECTRO-VOICE PART No.		
M1		55T + P-55-T	GD + 2756	66 PT-2	* Tone Arm Complete With Cartridge.

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

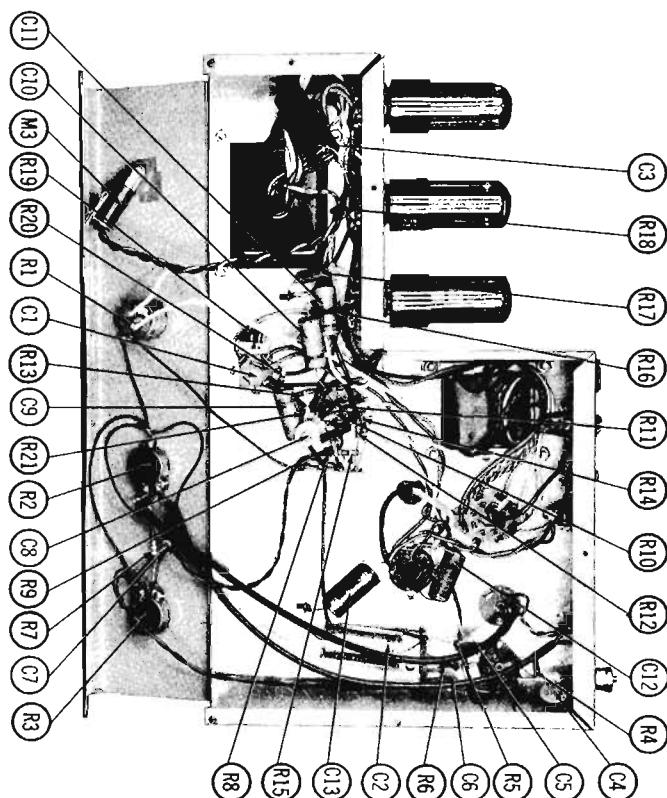
### PHONO NEEDLE (FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

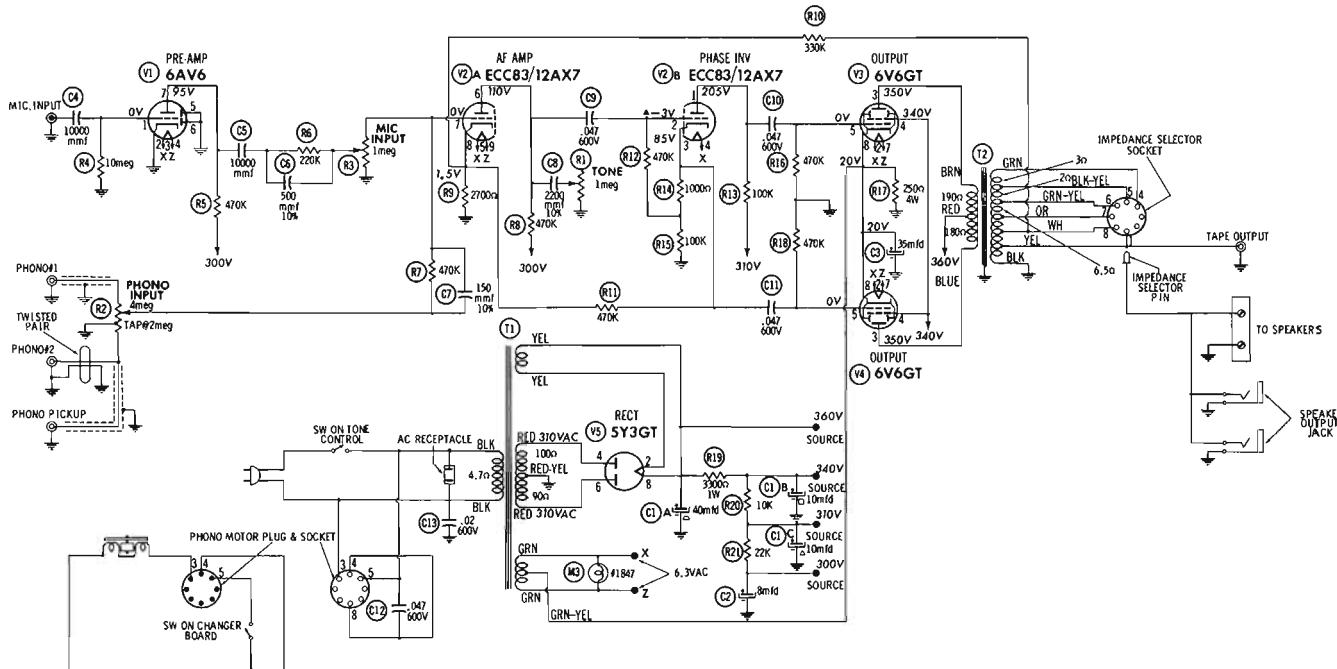
ITEM No.	REPLACEMENT DATA			REMARKS
	KNIGHT PART No.	JENSEN PART No.	WALCO PART No.	
M2		† A-71 or † A-71BD or • A-71D	• W-RTPA or † W-RTPB or † W-RDS or • W-RTPD	* Metal † Jewel • Diamond

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M3	Panel Lamp		#1847

### CHASSIS—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 of component values makes possible a variation of +10% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AV6	10Meg	0v	250v	250v	0v	† 500K			
V2	ECC83/12AX7	† 110K	570K	100K	250v	250v	† 500K	650K	2500v	250v
V3	6V6GT	0v	250v	† 190v	† 3300v	470K	NC	250v	250v	
V4	6V6GT	0v	250v	† 180v	† 3300v	470K	NC	250v	250v	
V5	5Y3GT	NC	20K(Min)	TP	100v	TP	90v	NC	20K(Min)	

† MEASURED FROM PIN 2 OF V5

▲ MEASURED FROM PIN 3 OF V2

TP TIE POINT

NC NO CONNECTION



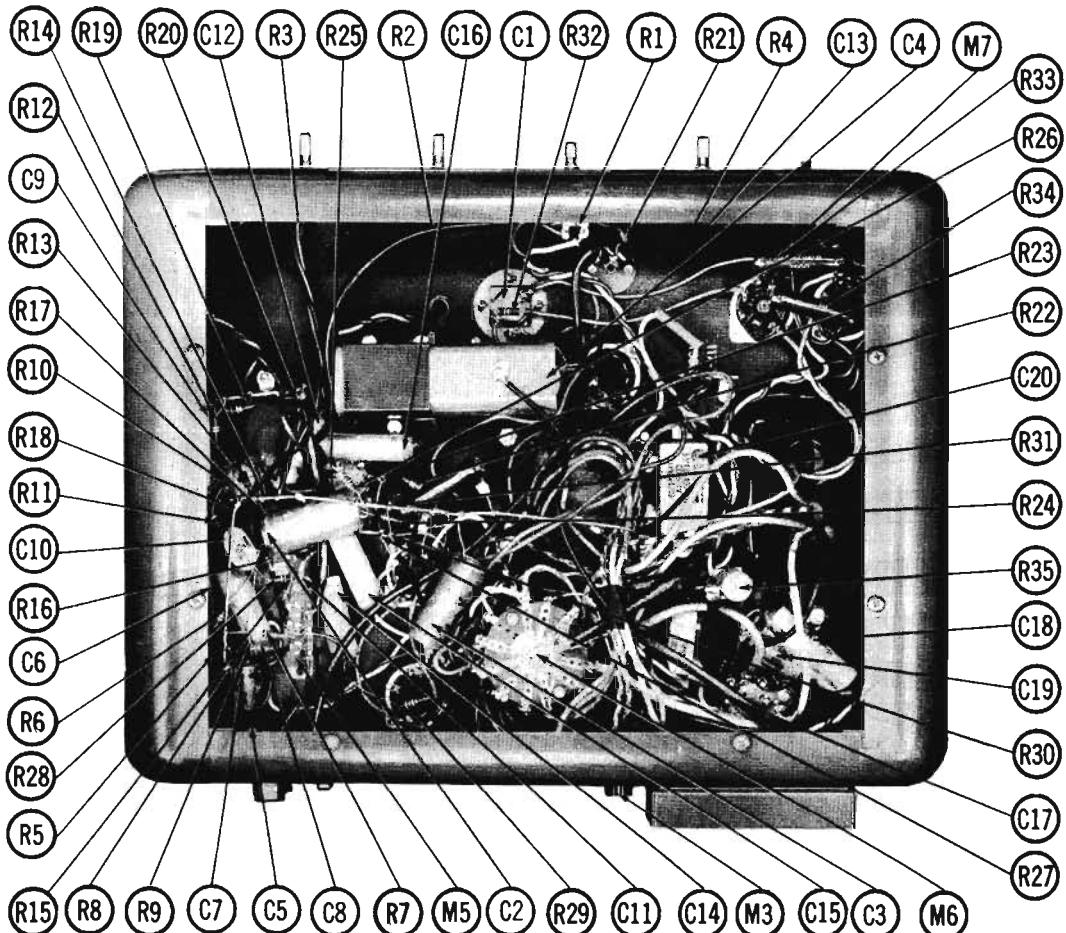
**KNIGHT  
MODEL 93SZ645**

TRADE NAME	Knight Model 93SZ645		
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.		
TYPE SET	AC (or) Battery Operated 4 Channel 25 Watt Mobile Audio Amplifier		
TUBES (Seven)	Types 12AX7 Mic. 1-Mic. 2-Mag. Preamp., 12AX7 Mic. 1-Mic. 2-Mag. Preamp. 12AX7 AF Amp. -Phase Inv., (2) 6L6G Output, (2) 6X5GT Rectifier		
POWER SUPPLY	110-130 Volts AC - 60 Cycles (or) 6 Volt Storage Battery (or) 12 Volt Storage Battery	RATING	.92 Amp. @ 117 Volts AC (100 Watts) (or) 15.5 Amp. @ 6.3 Volts DC (or) 8.75 Amp. @ 12.6 Volts DC

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CHASSIS BOTTOM VIEW

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

ITEM No.	USE	TYPE	NOTES
V1	Mic. 1-Mic. 2-Mag. Preamp.	12AX7	
V2	Mic. 1-Mic. 2-Mag. Preamp.	12AX7	
V3	AF Amp. -Phase Inverter	12AX7	
V4	Output	6L6G	

ITEM No.	USE	TYPE	NOTES
V5	Output Rectifier	6X5GT	
V6	Rectifier	6X5GT	

**ELECTROLYtic CAPACITORS**

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.40	450							
B	.10	450							
C	.10	450							
C2	6	450							
C3	35	50							
C4	4.0	600							
				PBS450V8 PBS100V40 JPG2M1R600V4	CO320 JDU9040	FP398.2 TC71 TC39 TX803	TMT-38 TD-6-450 ID-50-50 PLM6-4	Q-055 FM-1608 FM-0550 T105-4	TVL-3783 TVA-1704 TVA-1308 CR46

**FIXED CAPACITORS**

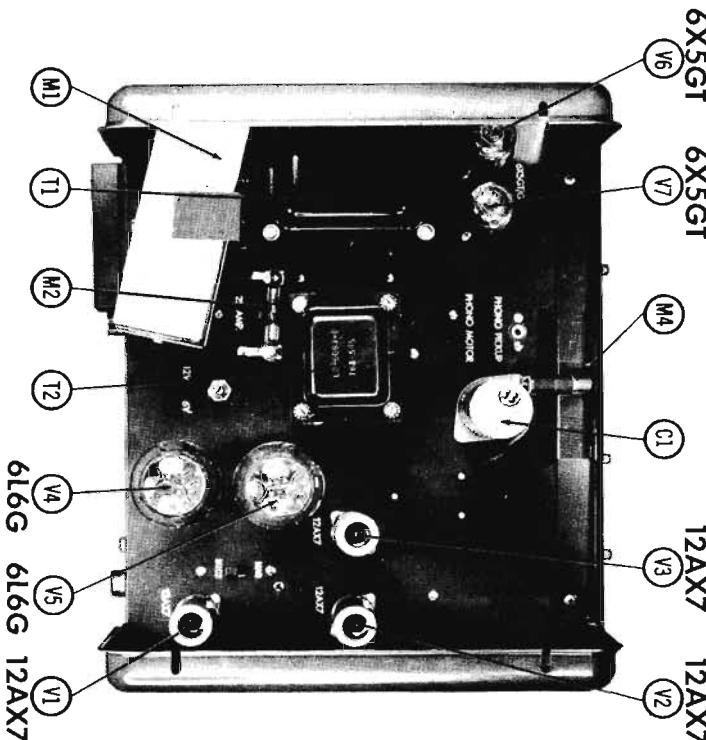
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

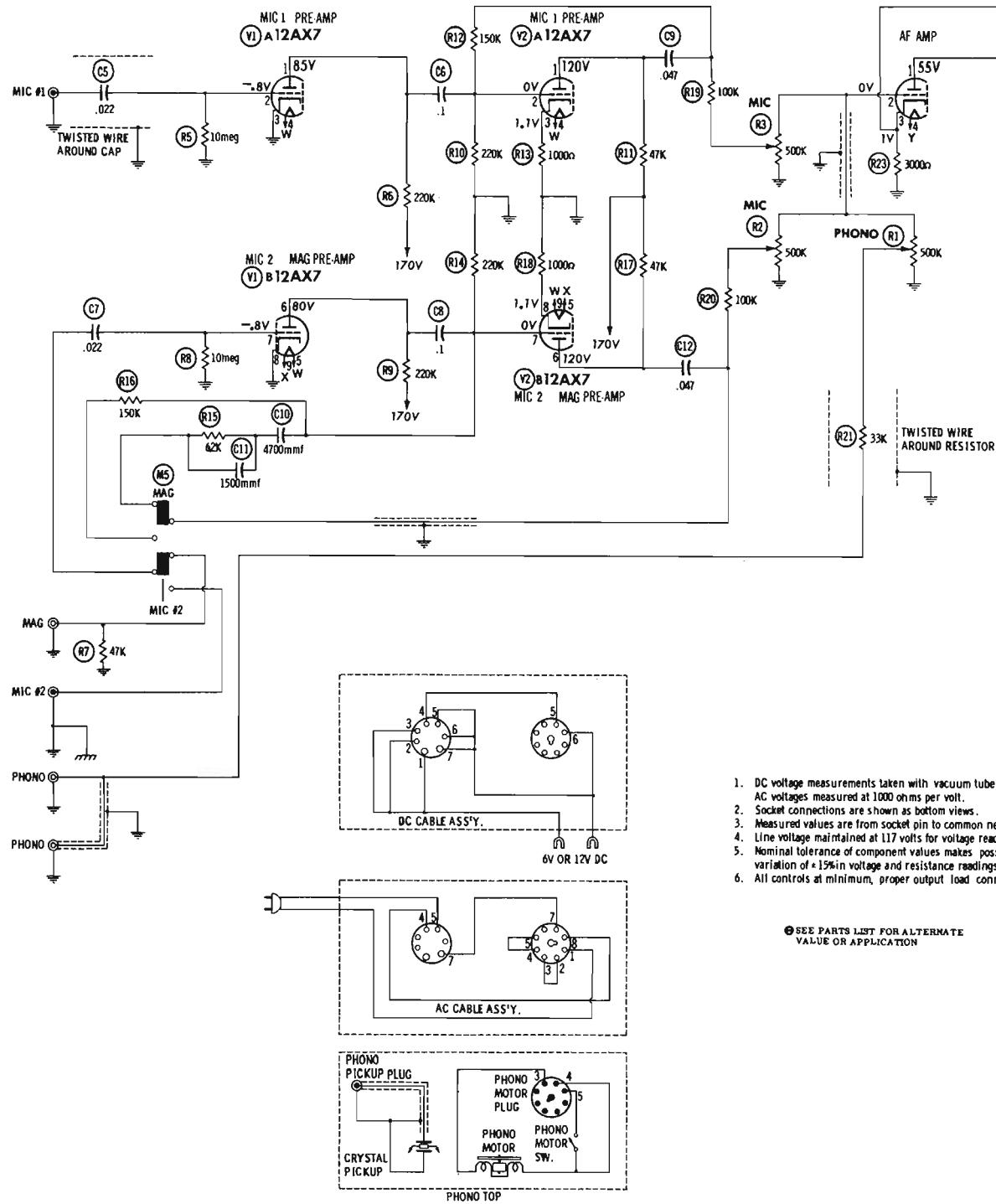
ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	.022	200		PBD-02	DD-203	CU194522	ED-02	GEM-412	4TM-522
C6	1	600		PBD-01	DD-104	CU19451	ED-02	GEM-601	6TM-51
C7	.022	200		PBD-02	DD-203	CU194522	ED-02	GEM-412	4TM-522
C8	1	600		PBD-01	DD-104	CU19451	ED-02	GEM-601	6TM-51
C9	.047	600		PBD-05	DF-503	CU194547	ED-017	GEM-617	6TM-547
C10	.070			PBD-0047	DD-478	KD79	ED-0047	UC-5247	5EK-D47
C11	.047			PBD-0015	DD-152	CU194547	ED-0015	UC-5215	5GA-D15
C12	.047	600		PBD-01	DF-105	CU194547	ED-017	GEM-617	6TM-547
C13	.047	600		PBD-05	DF-503	CU194547	ED-017	GEM-617	6TM-547
C14	.047	600		PBD-05	DF-503	CU194547	ED-017	GEM-617	6TM-547
C15	.047	600		PBD-05	DF-503	CU194547	ED-017	GEM-617	6TM-547
C16	.047	600		PBD-05	DF-503	CU194547	ED-017	GEM-617	6TM-547
C17	.47	200		P268N-47		CU192P47		GEM-4047	2TM-P47
C18	.47	200		P268N-47		CU192P47		GEM-4047	2TM-P47
C19	.47	200		P268N-47		CU192P47		GEM-4047	2TM-P47
C20	.5	400							

**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		AB-59	A47-500K-3	Q1-153	U50	Phone Volume	
B	Shaft			AK-59	K58-3	Not Req.	Not Req.		
C	Switch			KB-1	BWE-12	76-1	U8-26		
R2A	500K	1		AB-80	A47-500K-2	Q1-153	U48		
B	Shaft			AK-4	K58-3	Not Req.	Not Req.		
R3A	500K	1		AB-50	A47-500K-2	Q1-153	U48		
B	Shaft			AK-4	K58-3	Not Req.	Not Req.		
R4A	500K	1		AB-80	A47-500K-2	Q1-153	U48		
B	Shaft			AK-4	K58-3	Not Req.	Not Req.		

**CHASSIS—TOP VIEW**





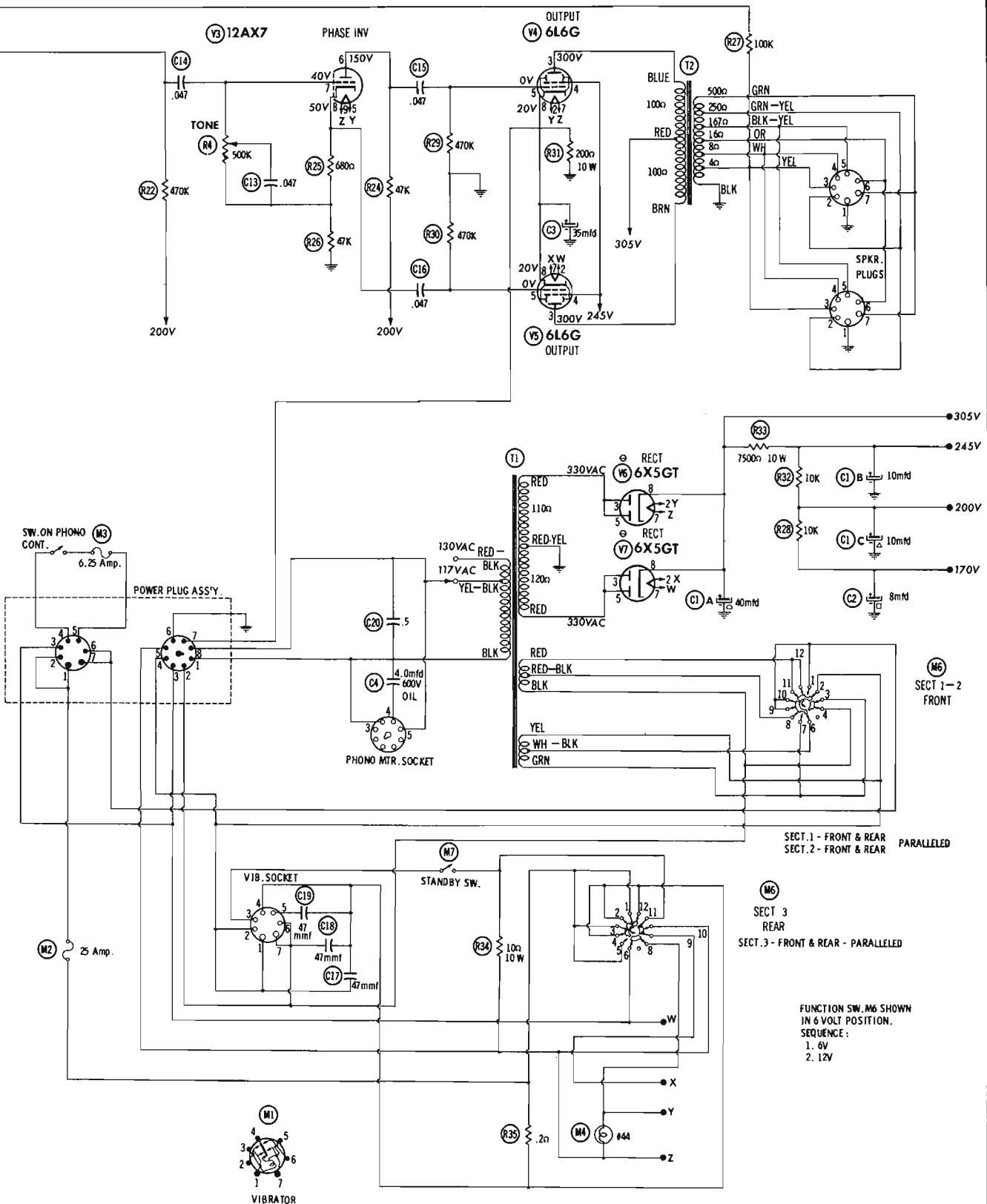
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of  $\pm 15\%$  in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	124K	10Meg	0Ω	200Ω	200Ω	124K	10Meg	0Ω	200Ω
V2	12AX7	175K	100K	1000Ω	200Ω	200Ω	175K	220K	1000Ω	200Ω
V3	12AX7	1485K	125K	3000Ω	200Ω	200Ω	165K	550K	48K	200Ω
V4	6L6G	TP	200Ω	110Ω	17500Ω	470K	TP	200Ω	200Ω	
V5	6L6G	TP	200Ω	110Ω	17500Ω	470K	TP	200Ω	200Ω	
V6	6X5GT	NC	200Ω	110Ω	NC	110Ω	TP	200Ω	30K	
V7	6X5GT	NC	200Ω	120Ω	TP	120Ω	NC	200Ω	30K	

† MEASURED FROM PIN 8 OF V6  
NC NO CONNECTION  
TP TIE POINT

A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING	REPLACEMENT DATA		NOTES
		KNIGHT PART No.	IRC PART No.	
OHMS	WATT			
R5	10Meg	BTS-10Meg		
R6	220K	BTS-220K		
R7	47K	BTS-47K		
R8	10Meg	BTS-10Meg		
R9	220K	BTS-220K		
R10	220K	BTS-220K		
R11	47K	BTS-47K		
R12	150K	BTS-150K		
R13	1000Ω	BTS-1000		
R14	220K	BTS-220K		
R15	80Ω 5%	BTS-80K 5%		
R16	150K	BTS-150K		
R17	47K	BTS-47K		
R18	1000Ω	BTS-1000		
R19	100K	BTS-100K		
R20	100K	BTS-100K		

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRL	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	Tried PART No.
<b>AC OPERATION</b>										
T1	130VAC Tap② 117VAC ③ .92A	880VCT ① 120A ② LSA ① ③ LSA ②	63VCT ① 63VCT ② 22A ②	63VCT ① 63VCT ② 22A ②	LP-0239A					
<b>DC OPERATION</b>										
PRL 1	600VCT ② 25A ③ ④ 25A ④	① 120A								
PRL 2	63VCT ② 25A ③ ④ 25A ④									

① 6V filament operation.

② 12V filament operation.

③ 6V input operation.

④ 12V input operation.

## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA					NOTES
		KNIGHT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	
PRL	SEC.						
T2	8KCCT	500Ω Tap② 250Ω, 167Ω, 167Ω, 167Ω, 4Ω	LO-0093-D				

### VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA				NOTES
				KNIGHT PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	
M1	Interrupter	6 or 12	60v	JV-002I	8VB6UL		8VB6UL	

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA				BUSS PART No.	
			KNIGHT PART No.		LITTELFUSE PART No.			
			FUSE	HOLDER	FUSE	HOLDER		
M2	4L	25A 4AG 319			4102E (4AG 25A) 318.25	4580I	MDM 25 4512	
M3	3AG	8 1/4A 32Y			3410I	MDL 8 1/4 HEP		

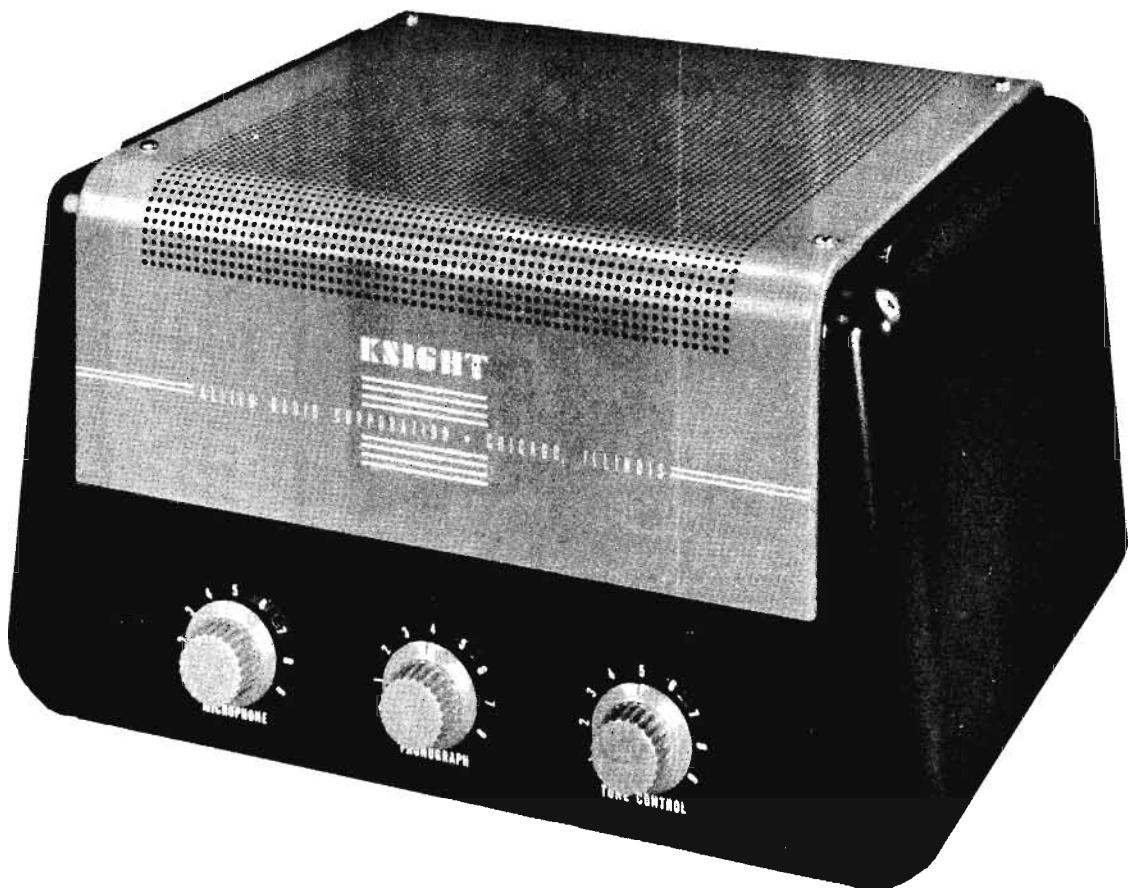
### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M4	Pilot Light		#44
M5	Switch		Mag-Mic. 2, Slide Type (DPDT)
M6	Switch		Power Changeover (Rotary, Wafer Type) 3 Gang.
M7	Switch		DC On-Stand By, Slide Type (SPST)

**PHOTOFAC<sup>T</sup> Folder**



**KNIGHT  
MODEL 93SZ655**



**KNIGHT  
MODEL 93SZ655**

TRADE NAME	Knight Model 93SZ655	
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.	
TYPE SET	AC Operated 3 Channel 15 Watt Audio Amplifier	
TUBES (Five)	Types 6SJ7 Mic Preamplifier, 6SC7 AF Amp.-Phase Inv., (2) 6V6GT Output, 5Y3GT Rectifier	
POWER SUPPLY	105-130 Volts AC 50/60 Cycles	RATING .8 Amp. @ 117 Volts AC (75 Watts)

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## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Mic Preamplifier	6SJ7	
V2	AF Amp. -Phase Inv.	6SC7	
V3	Output	6V6GT	

ITEM No.	USE	TYPE	NOTES
V4	Output Rectifier	6V6GT	5Y3GT

## 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	450							
B	.10	450							
C	.10	450							
C2	.8	450							
C3	.35	50							
			AFH3-4L	CO320	FP306.2	TMT-36	Q-055	TVL-3703	
			PR5450V8	PR5150V40	BR845	TC71	TD-8-450	FM-4508	TVA-1704
					BR505	TC39	TD-50-50	FM-0550	TVA-1308

## 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.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.047	600	BPD-05	DF-500	CUB6547	GEM-8147	6TM-547			
C5	.047	600	BPD-05	DF-500	CUB6547	GEM-8147	6TM-547			
C6	.047	600	BPD-05	DF-500	CUB6547	GEM-8147	6TM-547			
C7	.220		1468-00022	D6-22L	SWT22	GP-220	UC-5322	6TM-322		
C8	.0022	600	BPD-0022	D6-222	CUB6D22	ED-0022	GEM-8222	6TM-D22		
C9	.047	600	BPD-05	DF-503	CUB6547		GEM-8147	6TM-547		
C10	.047	600	BPD-05	DF-503	CUB6547		GEM-8147	6TM-547		
C11	.05	600	BPD-05	DF-503	CUB685		GEM-815	6TM-55		
C12	.047	600	BPD-05	DF-503	CUB6847		GEM-8147	6TM-547		

## CONTROLS

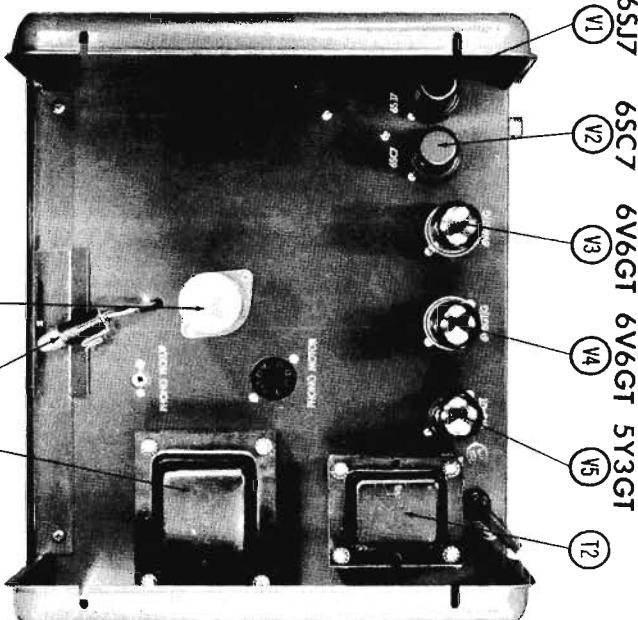
ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	KNIGHT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K Shaft	1/2		AB-59	A47-500K-S	QI-133	U50	Phone
B	Switch			AK-4	KSS-3	Not Req.		
C				KB-1	SW-12	U5-28		
R2A	500K Shaft	1/2		AB-60	A47-500K-Z	QI-133	U48	Mic.
B	Switch	1/2		AK-4	KSS-3	Not Req.		
R3A	500K Shaft	1/2		AB-60	A47-500K-Z	QI-133	U48	Tone
B				AK-4	KSS-3	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.	REPLACEMENT DATA	KNIGHT PART No.	IRC PART No.	
R4	100K				BTS-100K		BTS-470K	
R5	10Meg				BTS-10Meg		BTS-1500	
R6	470K				BTS-470K		BTS-470K	
R7	2.2Meg				BTS-2.2Meg		BTS-10K	
R8	470K				BTS-470K		BTS-470K	
R9	470K				BTS-470K		BTS-470K	
R10	10K				BTS-10K		PW10-280	
R11	470K				BTS-470K		BTA-3300	

## CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PR1	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Hallidorsen PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	130VAC (tap @ .085A) 117VAC (@ .8A)	650VCT (@ .085A)	5VAC (@ 3A)	6.3VCT (@ 1.85A)	LP-0188				22R08 (1)	

(1) This transformer does not provide a tap on primary winding for 130VAC input.

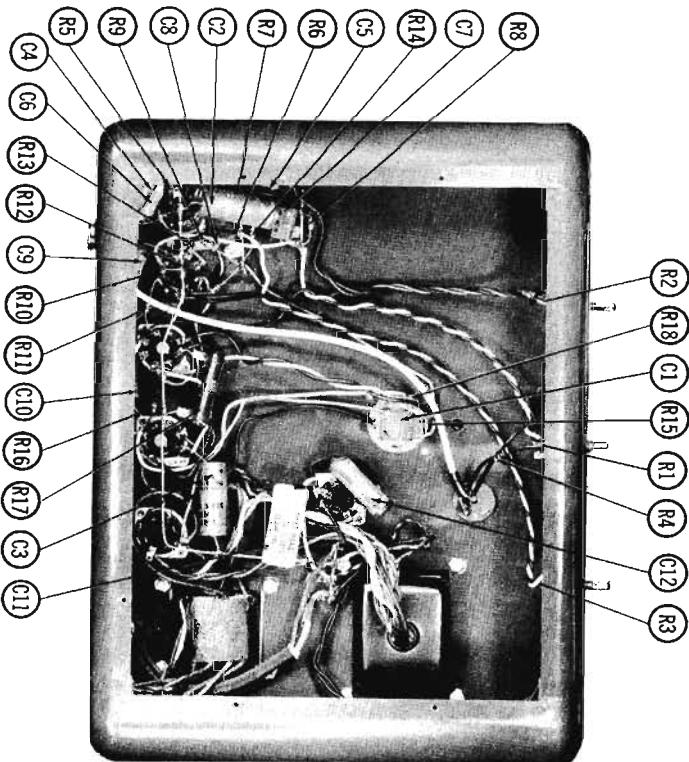
### TRANSFORMER (AUDIO OUTPUT)

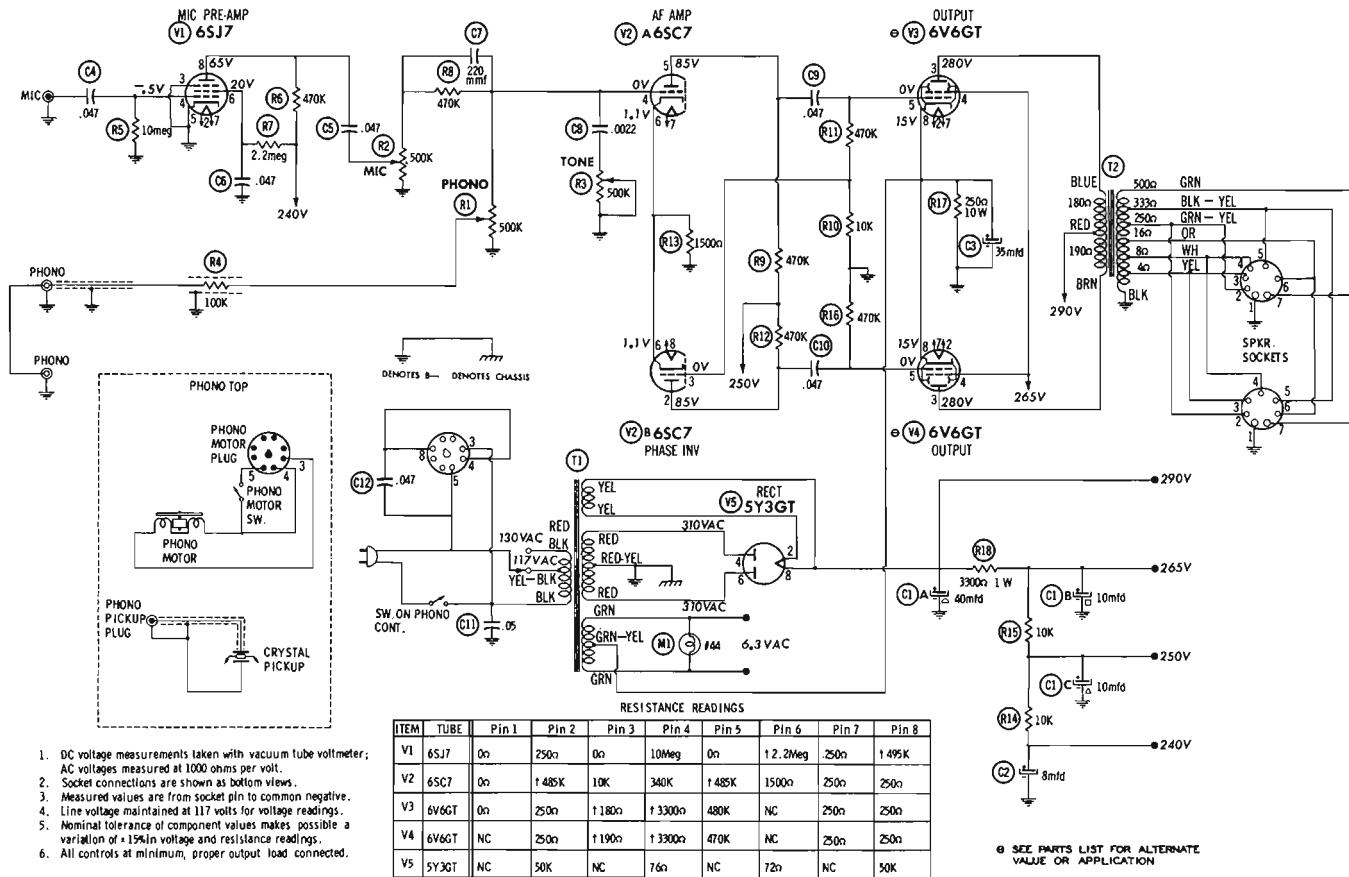
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PR1	SEC.	KNIGHT PART No.	Hallidorsen PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T2	10K CT 500Ω tap @ 333Ω (70V), 260Ω, 16Ω, 8Ω 4Ω	LO-0092-B						

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Pilot Light	#44	

## CHASSIS—BOTTOM VIEW





**PHOTOFAC<sup>TM</sup> Folder**



**KNIGHT  
MODEL 93SZ682**



**KNIGHT  
MODEL 93SZ682**

TRADE NAME	Knight Model 93SZ682
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Illinois
TYPE SET	AC Operated 5 Channel 30 Watt Audio Amplifier
TUBES (Six)	Types 6SC7 Preamplifier, 6SC7 Mixer, 6SC7 AF Amp. - Phase Inv., (2) 6L6G Output, 5U4G Rectifier
POWER SUPPLY	105-130 Volts AC-50/60 Cycles      RATING 1.18 Amp. @ 117 Volts AC (125 Watts)

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	MIC 1 Preamplifier — MIC 2 — Mag Preamplifier	6SC7	
V2	Mixer	6SC7	
V3	AF Amp. - Phase Inv.	6SC7	

ITEM No.	USE	TYPE	NOTES
V4	Output	6L6G	
V5	Output	6L6G	
V8	Rectifier	5U4G	

### 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	450			AFB3-41	C0320	FP396-2	TMT-35	Q-055
B	.10	450							TVL-3783
C	.10	400							
C2	.8	450							
C3	.35	50							
				PR2450V8 PR1850V40	BR845 BR805	TC71 TC39	TD-8-450 TD-50-50	FM-4508 FM-0450	TVA-1704 TVA-1308

### FIXED CAPACITORS

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

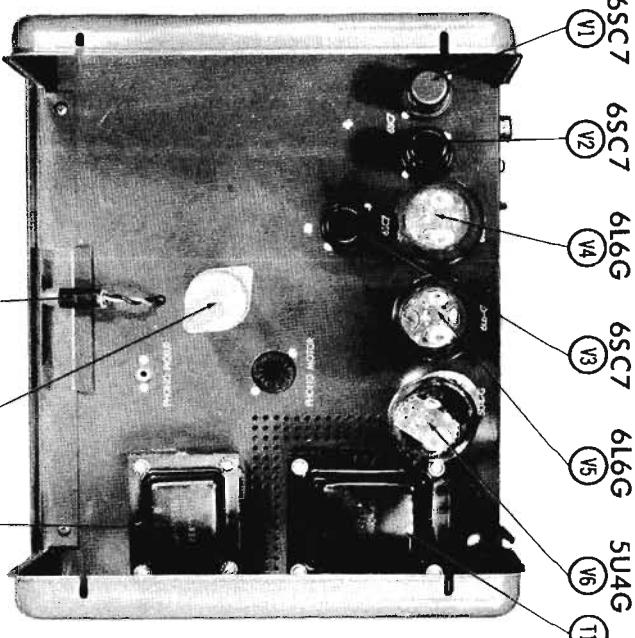
ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.047	600	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		
C5	.047	600	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		
C6	.047	600	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		
C7	4700		BPD-0047	DD-472	KOT9	ED-0047	UC-5247	5HM-D47		
C8	.01	600	BPD-01	DD-105	CUB8547	DD-105	ED-01	GEM-0147	DTM-847	
C9	.047	600	BPD-05	DD-503	CUB8547	DD-503	GEM-0147	DTM-847		
C10	.047	500	BPD-05	DD-503	CUB8547	DD-503	GEM-0147	DTM-847		
C11	.39		1465-000039	DG-332	5R5Q99	CUB86D3	GEM-0147	MS-439		
C12	.00033	600	BPD-0033	DG-332	CUB86D3	DG-332	GEM-6233	DTM-D33		
C13	.22		1465-00022				GEM-3141			Note #1
C14	.047	600	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		
C15	.047	600	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		
C16	.05	600	BPD-05	DP-503	CUB8545	DP-503	GEM-0147	DTM-847		
C17	.047	500	BPD-05	DP-503	CUB8547	DP-503	GEM-0147	DTM-847		

Note #1. Some Versions Use 330MMF In This Application.

### 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	1/2		AB-59	A47-500K-S	Q1-133	U50		Phono
B	500K			AK-4	X58-5	Not Req.	Not Req.		
C	Switch			KD-1	BWE-12	76-1	US-28		
R2A	500K	1/2		A3-59	A47-500K-S	Q1-133	U50		MIC 2-Mag
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.		
C	Switch			KD-1	BWE-12	76-1	US-28		
R3A	500K	1/2		AB-50	A47-500K-Z	Q3-133	U48		MIC 1
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.		
R4A	500K	1/2		AB-50	A47-500K-Z	Q3-133	U48		Tone
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.		

### 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
	OHMS	WATT	KNIGHT PART No.	IRC PART No.		
R5	10Meg		BTS-10Meg			
R6	220K		BTS-220K			
R7	10Meg		BTS-10Meg			
R8	100K		BTS-100K			
R9	220K		BTS-220K			
R10	47K		BTS-47K			
R11	100K		BTS-100K			
R12	22K		BTS-22K			
R13	180K		BTS-180K			
R14	1.5MΩ		BTS-1.5MΩ			
R15	1.5Meg		BTS-1.5Meg			

ITEM No.	RATING		REPLACEMENT DATA			NOTES
	OHMS	WATT	KNIGHT PART No.	IRC PART No.		
R16	470K		BTS-470K			
R17	10K		BTS-10K			
R18	470K		BTS-470K			
R19	470K		BTS-470K			
R20	1500Ω		BTS-1500			
R21	10K		BTS-10K			
R22	10K		BTS-10K			
R23	470K		BTS-470K			
R24	200Ω	10	PW10-200			
R25	7500Ω	10	PW10-7500			

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	KNIGHT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	Triad PART No.
T1	130VAC Tap @ 117VAC @ 1.10A	725VCT @ .155A	5VAC @ 3A	6.3VCT @ 2.9A	LP-0198-B				24R05 (1)	

(1) This Transformer Does Not Provide A Tap On Primary Winding For 130VAC Input.

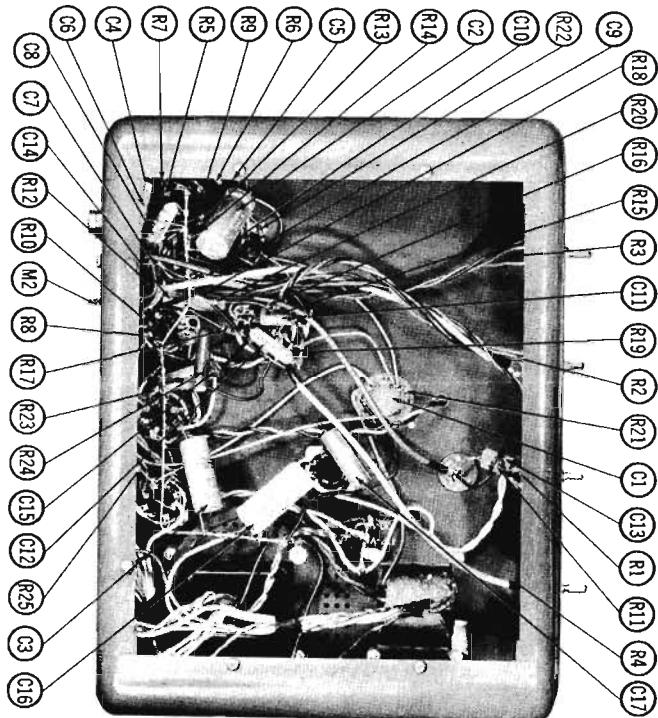
### TRANSFORMER (AUDIO OUTPUT)

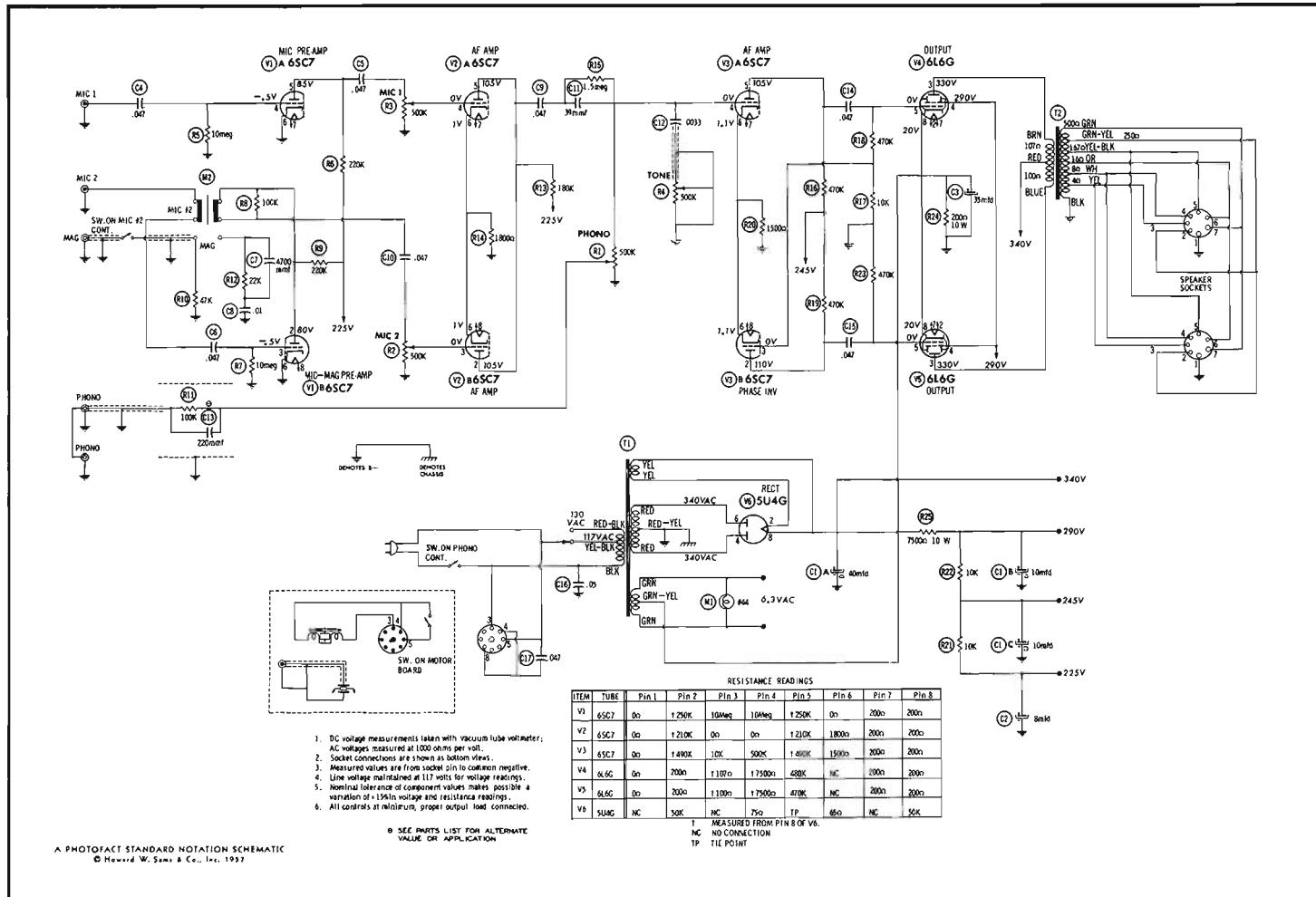
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	KNIGHT PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordorson PART No.	
T2	8000Ω Tape @ 250Ω 10Ω (70Ω) 15Ω 8Ω 4Ω	500Ω	LO-0093-D					

### MISCELLANEOUS

ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M1	Pilot Light		#44
M2	Switch		Mag. - MIC 2, Slide Type (D. P. D. T.)

### CHASSIS—BOTTOM VIEW

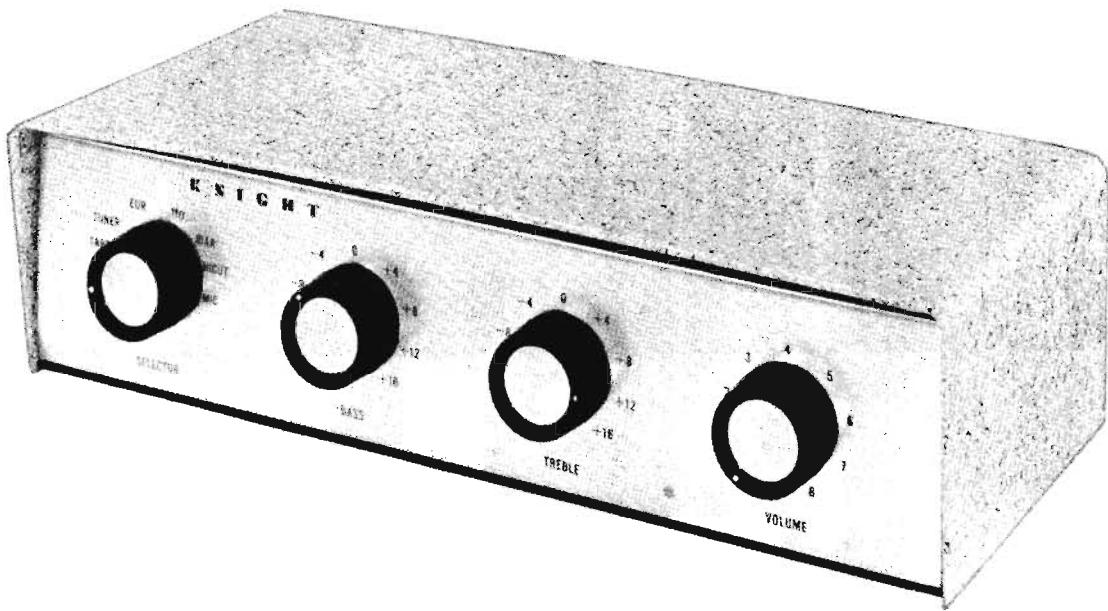




# PHOTOFAC<sup>T</sup>\* Folder



## KNIGHT MODEL 94SX706



**KNIGHT  
MODEL 94SX706**

TRADE NAME	Knight Model 94SX706	
SUPPLIER	Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill.	
TYPE SET	AC Operated Equalizer Preamplifier	
TUBES (Three)	Types 12AX7 Preamplifier, 12AX7 Cath. Follower - 1st AF Amp., 6C4 2nd AF Amplifier	
POWER SUPPLY	110-120 Volts AC-50/60 Cycles	RATING .15 Amp. @ 117 Volts AC (7 Watts)

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## PARTS LIST AND DESCRIPTIONS

### TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Phono - Mic Preamplifier	12AX7	
V2	Cathode Follower-1st AF Amplifier	12AX7	

ITEM No.	USE	TYPE	NOTES
V3	2nd AF Amplifier	6C4	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	KNIGHT PART No.	AEROVOX PART No.	CORNELL-DUBLIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.030	150			C0070	FP226	TMD-7	T-025	TVL-3535
B	.15	150				TC47	TD-16-150		
C	.15	150							
C2A	.10	150		AFH3-22	C0210	FP330.5	TMT-22	T-085	TVL-3432.8
B	.10	150							
C	.050	150							
C3	.05	50		PRS150V40	BR505	TC59	TD-50-50	FM-0550	TVL-1308

### FIXED CAPACITORS

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

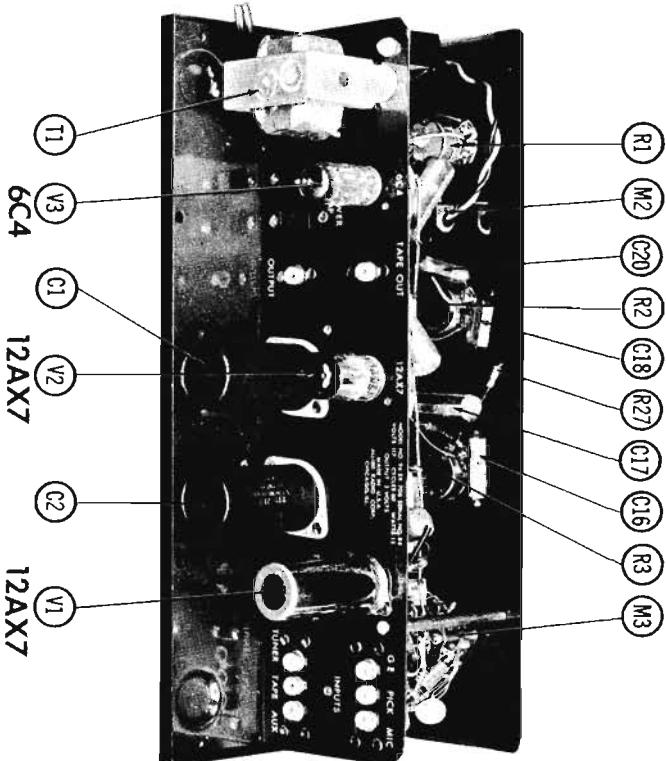
ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT	KNIGHT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLIER PART No.	ERIC PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.1	600		P88RN-1	DF-104	CUBBPI	GEM-501	8TM-PI		
C5	.050	1000								
C6	.00088	600								
C7	2300									
C8	1000									
C9	.560									
C10	4700									
C11	.270									
C12	.01	800								
C13	.022	200								
C14	.022	200								
C15	.1	800								
C16	.00068	600		P88RN-1	DF-104	CUBBPI	ED-270	UC-5327	6GA-T27	
C17	.058	600								
C18	.15	600								
C19	.330									
C20	.0033	600		1488-000015	DD-150	CUBB668	ED-15	UC-5415	1FM-415	Note 1
C21				BPD-00085	DD-311	CP-6800	ED-330	UC-5333	56A-T33	
C22				BPD-00232	DD-223	KOT75	ED-0232	UC-5222	56A-D22	
C23				BPD-001	DD-102	KO86	ED-001	DC-511	56K-S1	
C24				BPD-0047	DD-473	KOT79	ED-0047	UC-5247	8HK-D47	
C25				BPD-00027	DD-271	KO54	ED-270	UC-5327	6GA-T27	
C26				BPD-01	DD-103	CUBB68	ED-01	GM-411	8TM-S1	
C27				BPD-012	DD-203	CUBB623	ED-02	GM-4122	4TM-S22	
C28				BPD-02	DD-303	CUBB622	ED-02	GM-4123	4TM-S22	
C29						CUBB682	ED-02	GM-501	8TM-S1	
C30										
C31										
C32										
C33										
C34	.02	600		BFD-02	DD-303	CUBB682	ED-02	GM-812	8TM-S1	

Note 1. Not used in some versions.

### 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	1/2		AB-59	A47-500K-8	Q1-133	U50	Volume
B	8Mft			AK-4	K3B-3	Not Req.	Not Req.	
C	Switch			KB-1	8WB-12	78-1	UB-26	
R2A	500K	1/2		AB-60	A47-500K-Z	Q3-133	U48	Treble
B	8Mft			AK-4	K3B-3	Not Req.	Not Req.	
R3A	500K	1/2		AB-60	A47-500K-Z	Q3-133	U48	Bass
B	8Mft			AK-4	K3B-3	Not Req.	Not Req.	
R4A	500K	1/2		AB-60	A47-500K-Z	Q3-133	U48	Tuner Level
B	8Mft			AK-4	K3B-3	Not Req.	Not Req.	

### CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	REPLACEMENT DATA		NOTES
	KNIGHT PART No.	IRC PART No.	
R5	27K	BTS-27K	
R6	22K	BTS-22K	
R7	470K	BTS-470K	
R8	68K	BTS-68K	
R9	68K	BTS-68K	
R10	68K	BTS-68K	
R11	68K	BTS-68K	
R12	100K	BTS-100K	
R13	150K	BTS-150K	
R14	100K	BTS-100K	
R15	220K 1%	DCC-220K 1%	
R16	4700Ω 6%	BTS-4700 6%	
R17	4700Ω	BTS-4700	
R18	470K	BTS-470K	
R19	47K 5%	BTS-47K 5%	
R20	1500Ω 5%	BTS-1500 5%	

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA				
	PRL	SEC. 1	SEC. 2	Hallidore PART No.	Merritt PART No.	Stoncor PART No.	Thordarson PART No.	Triod PART No.
T1	117VAC	120VAC	6.3VCT ④ .10A ④ .002A ④ .72A	LP-0243		P-3048①		26R32①

① Drill New Mtg. Hole.

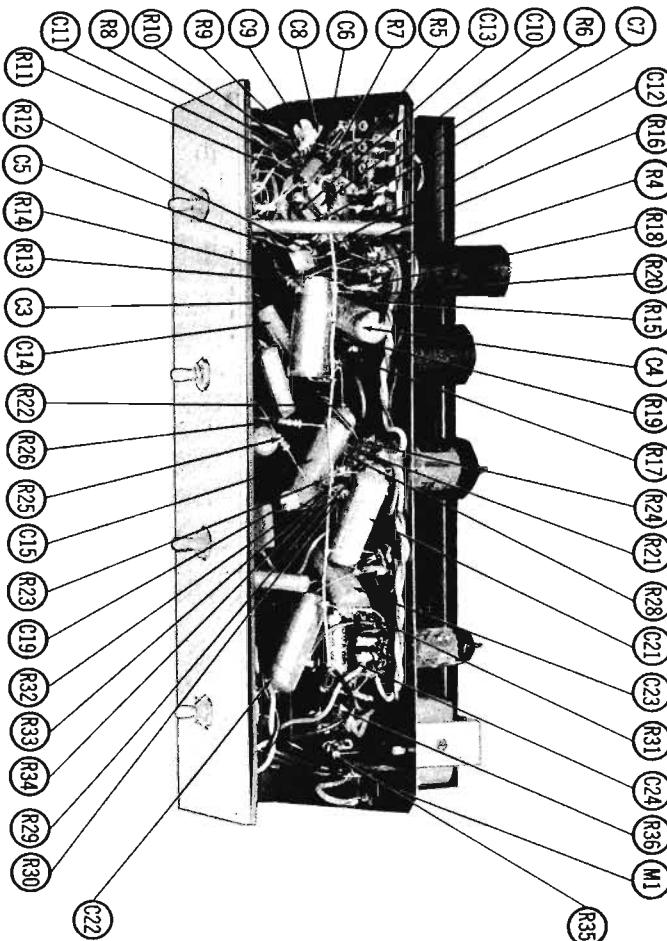
### SELENIUM RECTIFIER

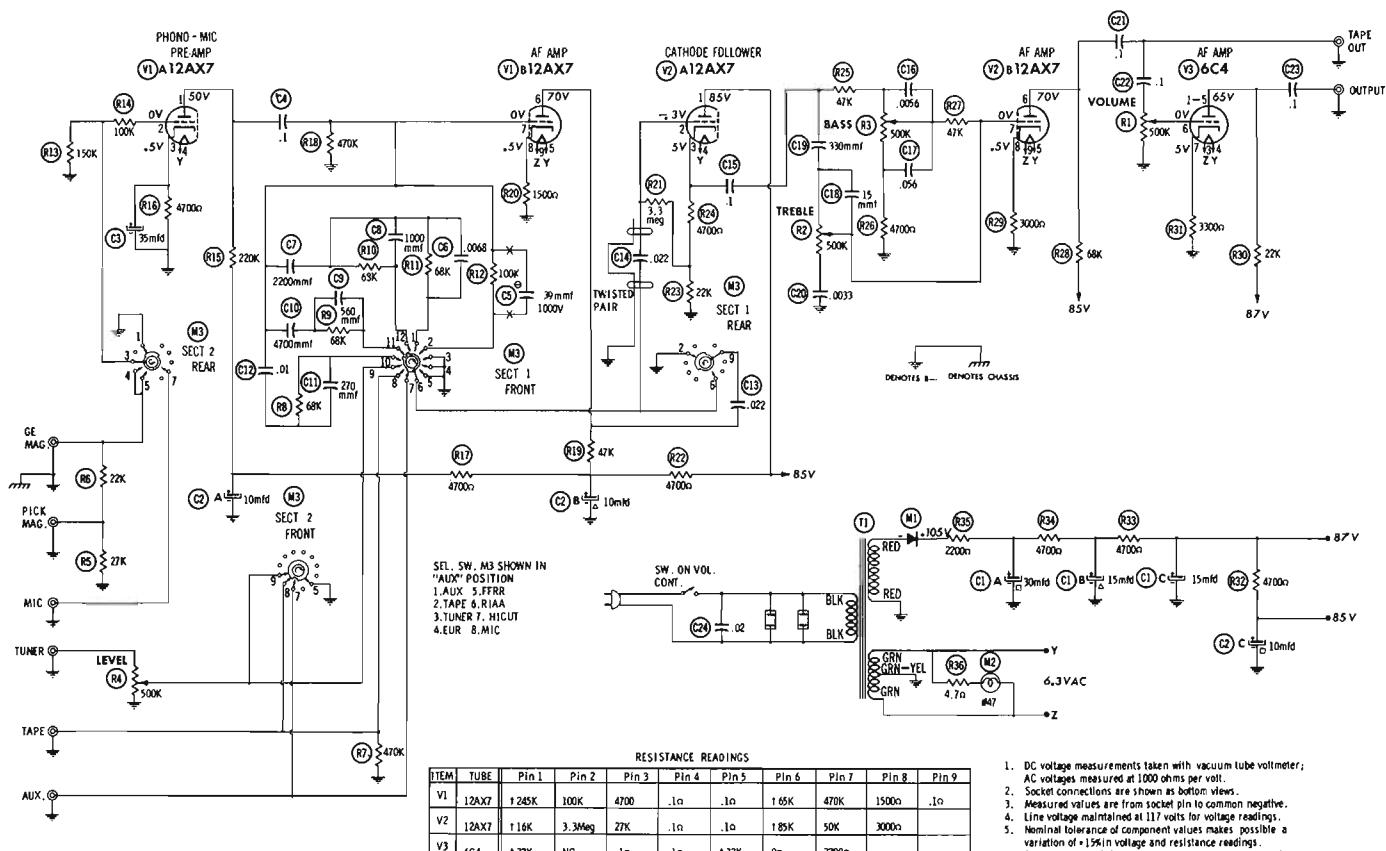
ITEM No.	RATING		REPLACEMENT DATA					NOTES
	CURRENT	KNIGHT PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	
M1	.002A	JR-0022	1386	RB-050	8830	BY1	60	

### MISCELLANEOUS

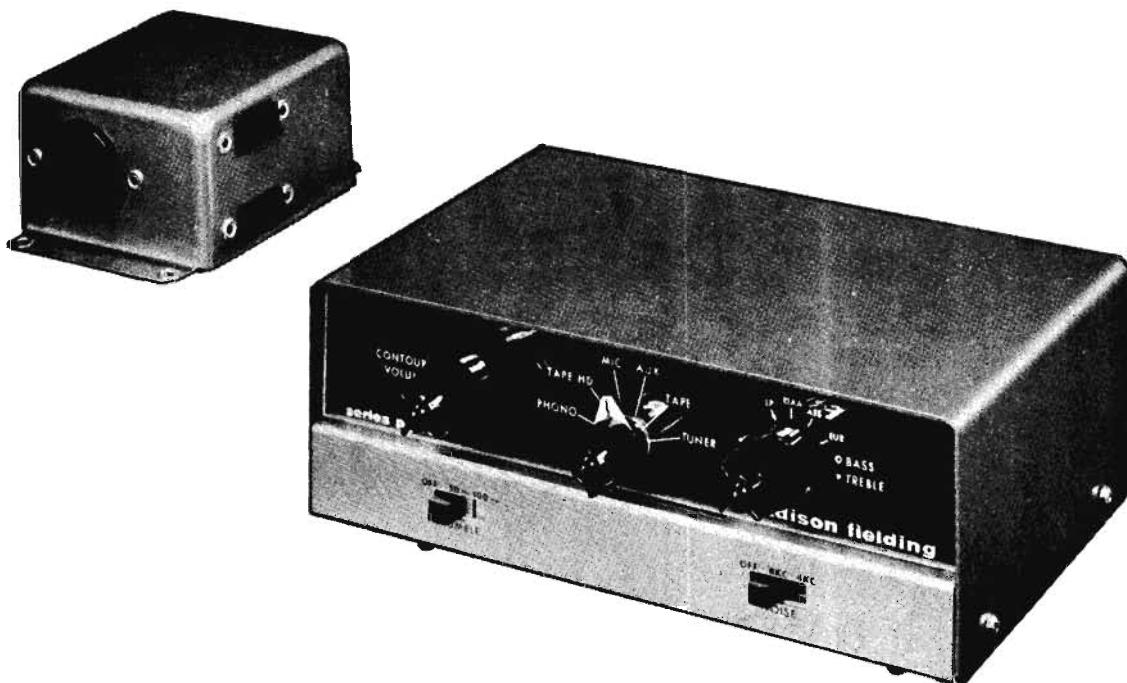
ITEM No.	PART NAME	KNIGHT PART No.	NOTES
M2	Dial Lamp Switch		#47
M3			Function Selector, 2 Gang, Wafer Type

## CHASSIS—BOTTOM VIEW





1. DC voltage measurements taken with vacuum tube voltmeter;
2. AC voltages measured at 1000 ohms per volt.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ± 5% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.



**MADISON FIELDING  
MODEL PR-45 "Transamp"**

TRADE NAME	Madison Fielding Model PR-45 "Transamp"		
MANUFACTURER	Madison Fielding Corp., 863 Madison St., Brooklyn 21, N. Y.		
TYPE SET	AC Operated 6 Channel Preamplifier With Transistorized Input		
TUBES (One)	Type 12AX7/ECC83 AF Amplifier		
POWER SUPPLY	105-125 Volts AC-50/60 Cycles	RATING	.10 Amp. @ 117 Volts AC (6 Watts)

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

ITEM No.	USE	TYPE
V1	AF Amplifier	12AX7/ECC83

**TRANSISTORS**

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA			NOTES
			CAS PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N35	AF Amplifier	2N439		2N35	
X2	2N36	AF Amplifier	2N439		2N35	

**ELECTROLYTIC CAPACITORS**

ITEM No.	RATING	REPLACEMENT DATA							NOTES	
		CAP.	VOLT.	MADISON FIELDING PART NO.	AEROVOX PART NO.	CORNELL-DUBLINER PART NO.	MALLORY PART NO.	PYRAMID PART NO.	SANGAMO PART NO.	SPRAGUE PART NO.
C1A	20	200		CE202010						R2472 *
B	20	200								
C	20	150								
C2	2	15								
C3	2	15								
C4	150	2								
C5	150	15								
C6	150	20								
C7	2	25								
C8	25	3								
C9	25	3								

\* Not 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
		MADISON FIELDING PART NO.	AEROVOX PART NO.	CENTRALAB PART NO.	CORNELL-DUBLINER PART NO.	ERIE PART NO.	MALLORY PART NO.	SPRAGUE PART NO.	
C10	3500				IR5D06			MS-235	10%
C11	8700				BY3862	ED-02		MS-235	10%
C12	3500				BY3862	ED-02		5KX-82	10%
C13	10000				CU82P1			5KX-82	
C14	20000				BYA10D22	ED-0022	GEM-20I	5GA-D22	
C15	1				BYA10D47	ED-0047	UC-5247	5GA-D47	NPO
C16	2200				CI0VBC		UC-5418	5GA-Q18	
C17	4700				LTCQ18	GP-18	DC-31U	5GA-Q18	
C18	0				DD-103	ED-01	DC-31U	5GA-Q18	
C19	18				BYA661	ED-01	UC-5447	5GA-Q47	
C20	10000				LTCQ47	GP-047	GEM-2022	2TM-P22	
C21	10000								
C22	47								
C23	22	200							

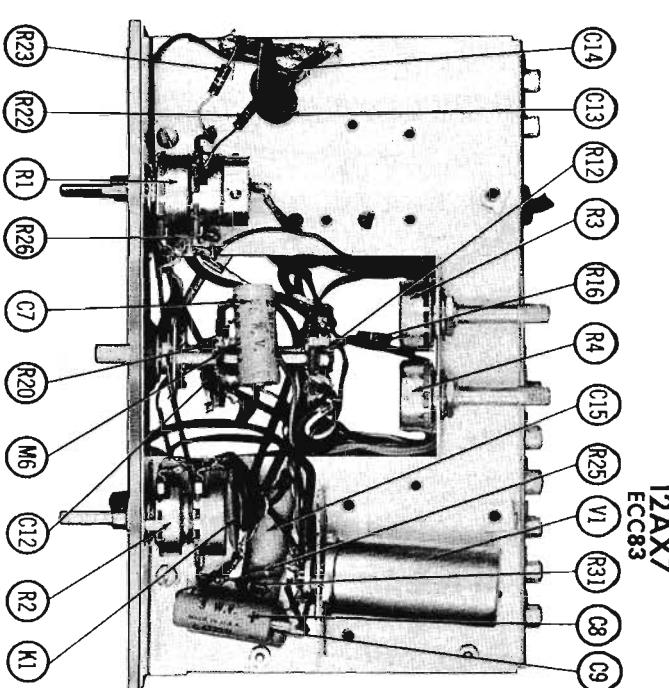
**CONTROLS**

ITEM No.	RATING		MADISON FIELDING PART NO.	CENTRALAB PART NO.	CLAROSTAT PART NO.	IRC PART NO.	MALLORY PART NO.	INSTALLATION NOTES	
	RESISTANCE	WATTS						Volume Contour, Tap @ 25K & 50K	Base Treble, Tap @ 260K Tuner Adjust
R1A	500K	1/2	RV10502	F1-52			UE3781B		
B	100K	1/2		R4-42					
C	Switch	1/meg		B-59					
R2A	500K	1/2	RV1002	RG-1	A4-7-500K-S	Q11-135	UE3762		
B	470K	1/2		RG-1	K5B-3	Not Req.	UE3762		
R3A	470K	1/2	RV6043	B-26	A4-1-25K-S	Q11-120	UE3762		
B	Shaft				K5B-3	Not Req.	UE3762		
R4A	25K	1	RV2530	RG-1					
B	Switch	1		RG-1					
R5A	500Ω	2	RW500L						

\* Concentrik Equivalent; K-2 Kit, Base Elements and Shafts: BII-137, PI-200 (Panel)

▲ STA-LOC Equivalent FB55A, OG500, RU15DT54, ISU125, US-41

■ STA-LOC Equivalent FB16L, OG600, RU55T244, ISU125

**CHASSIS—TOP VIEW**

## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING		Madison Fielding PART No.	NOTES
	OHMS	WATT		
R6	270K			
R7	150K			
R8	6800Ω			
R9	10K			
R10	180K			
R11	5.600			
R12	380K			
R13	18K			
R14	100K			
R15	18K			
R16	100K			
R17	18K			
R18	18K			
R19	22K			
R20	22K			

ITEM No.	RATING		Madison Fielding PART No.	NOTES
	OHMS	WATT		
R21	33K			
R22	10K			
R23	10K			
R24	100K			
R25	2700Ω			
R26	470K			
R27	820K			
R28	220K			
R29	1. 8meg			
R30	220K			
R31	1500Ω			
R32	150K			
R33	22K			
R34	10K			

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Madison Fielding PART No.	Hallidore PART No.	Merrit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @ .100A	155V @ .002A	6.3V @ .300A		TP1003					

### COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	Madison Fielding PART No.	REPLACEMENT DATA		
K1	Tone Comp.	4700mμf, 4700mμf, 100mμf, 100K, 470K, 1000Ω				

### RECTIFIERS

ITEM No.	CURRENT (Measured)	REPLACEMENT DATA				NOTES
		Madison Fielding PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1	.0018A	SR1001			CR28	

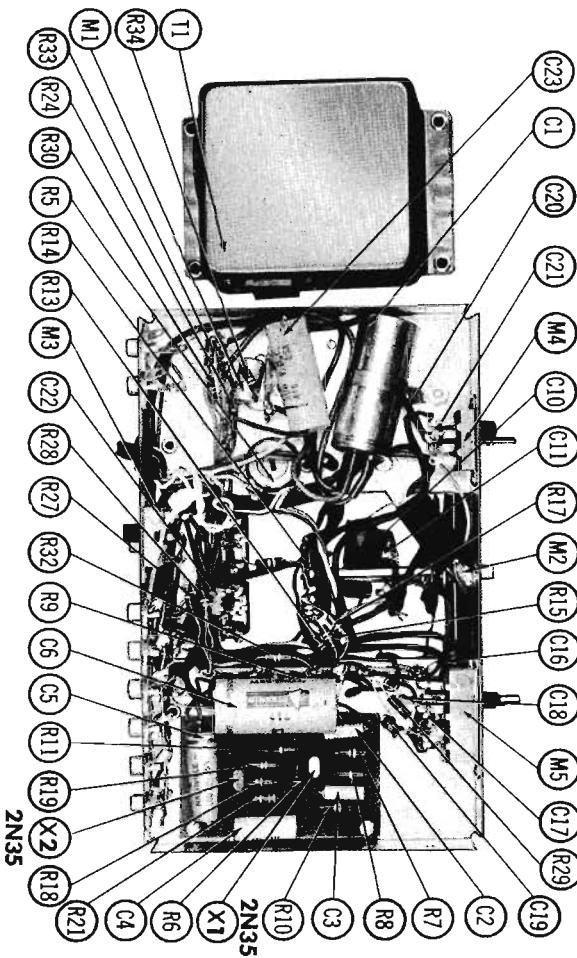
### MISCELLANEOUS

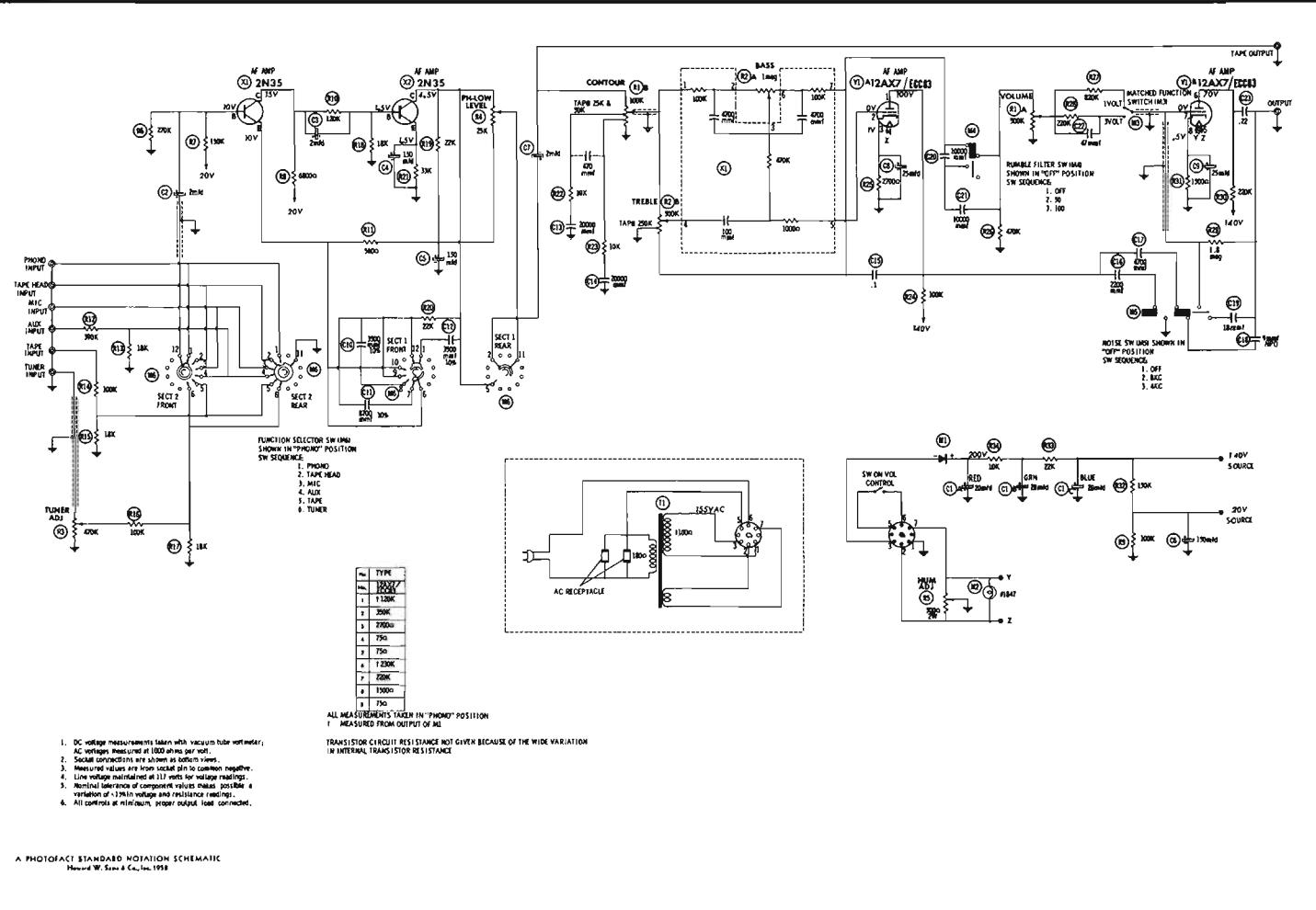
ITEM No.	PART NAME	Madison Fielding PART No.	NOTES
M2	Pilot Lamp		#1847
M3	Switch	SS1007	Matched Function (Slide Type SPDT)
M4	Switch	SS1002	Runble Filter (Slide Type DPD)
M5	Switch	SS1006	Noise Filter (Slide Type DPDT)
M6	Switch	SF1003	Selector (Rotary Wafer Type)

### 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
Power Pick-up Arm Cable .....	Use BELDEN No. 8430 (Two Conductor - Twisted)

### CHASSIS—BOTTOM VIEW







**NEWCOMB  
MODEL CO-1010**

TRADE NAME	Newcomb Model CO-1010
MANUFACTURER	Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.
TYPE SET	AC Operated 6 Channel 10 Watt Audio Amplifier
TUBES (Five)	Types 12AX7 Preamp. - AF Amp., 12AX7 AF Amp. - Phase Inv. (2) 6V6GT Output 6AX5GT Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles      RATING .55 Amp. @ 117 Volts AC (60 Watts)

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

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## **PARTS LIST AND DESCRIPTIONS**

### **TUBES (GENERAL ELECTRIC, SYLVANIA)**

ITEM No.	USE	TYPE	NOTES
V1	Preamplifier-AF Amplifier	12AX7	
V2	AF Amplifier-Phase Inv.	12AX7	
V3	Output	8V6GT	

ITEM No.	USE	TYPE	NOTES
V4	Output	6V6GT	
V5	Rectifier	6AX5GT	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP. μF	VOLT.	NEWCOMB PART No.	AEROVOX PART No.	CORNELL- DUBLIRITE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
CIA	▲ 40	475	CE-36						R2410*
CB	▲ 40	475							
CD	▲ 50	50							
C2	4	450	CE-1	PR5450V4	BR445	TC70	TD-4-150	FM-4504	TVA-1702

\*Non Catalog Item

## FIXED CAPACITORS

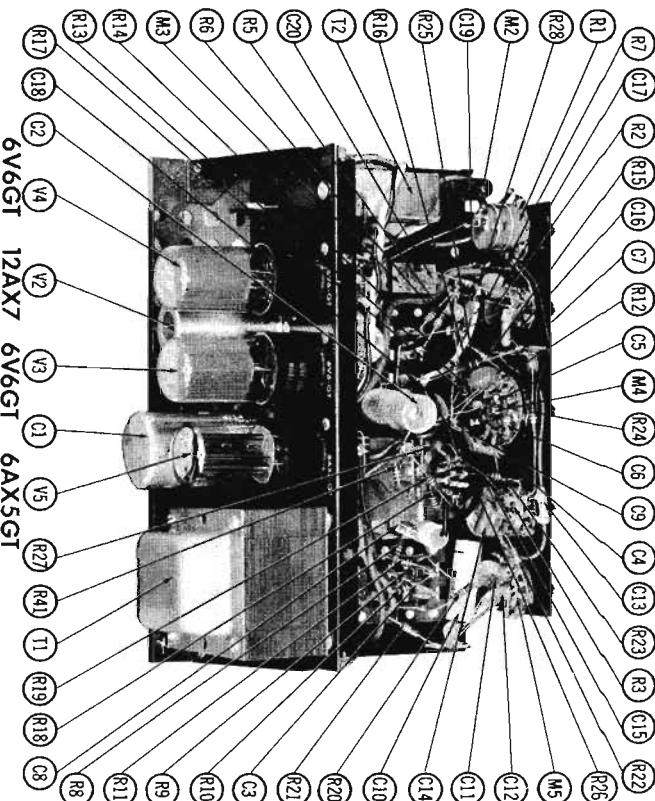
**Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.**

ITEM No.	RATING		NEWCOMB PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL- DUBLINER PART No.	ERIE PART No.	REPLACEMENT DATA		NOTES
	CAP.	VOLT.						Part No.	Part No.	
C3	20000		CM-35	BPD-02	DD-203	BYBS2	ED-350	UC-5335	5HK-S	
	450		S100	BPD-01	DD-103	L7T81	GP-100	UC-531	5GA-T1	
C5	100		CM-14	BPD-01	DD-101	L7T81	GP-300	UC-533	5GA-T3	
C6	300		CM-15	S1300	DD-101	L7T81	ED-0015	UC-5215	5HK-D15	
C7	1600		CM-52	BPD-0015	DD-152	YBA10DS	ED-0015	UC-5215	5HK-D15	
C8	.022	600	CP-47	BPD-02	DD-203	CUBS22	ED-02	GEM-612	6TM-S22	
C9	10000		CM-32	BPD-01	DD-103	YBAS1	ED-01	DC5II	5HK-SI	
	600		CM-31	BPD-01	DD-103	YBAS1	ED-01	GEM-601	6TM-P10	
C11	20000		CM-36	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-SI	
C12	20000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C13	470		CM-25	SI470	D-471	L7T847	GP-470	UC-5347	5CA-T47	
C14	1500		CM-27	S1500	D-152	L7D015	GP-1500	UC-5215	5HK-D15	
C15	20000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C16	470		CM-25	SI470	D-471	L7T847	GP-470	UC-5347	5CA-T47	
C17	10000		CM-32	BPD-01	DD-103	YBAS1	ED-01	DC5II	5HK-SI	
C18	20000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C19	250		CM-22	BPD-00025	DD-251	L7U25	ED-25	UC-5325	5CA-T25	
C20	10000		CM-32	BPD-01	DD-103	YBAS1	ED-01	DC5II	5HK-SI	
C21	10000		CM-32	BPD-01	DD-103	YBAS1	ED-01	DC5II	5HK-SI	
C22	20000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C23	10000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C24	20000		CM-35	BPD-02	DD-203	BYBS2	ED-02	DC5II	5HK-S2	
C25	100		CM-14	S100	D-01	L7T81	GP-100	UC-531	5GA-T1	
	600		CP-47-1	BPD-02	DD-203	CUBS22	ED-02	GEM-612	6TM-S2	

## CONTROLS

ITEM No.	REPLACEMENT DATA						INSTALLATION NOTES
	RATING	NEWCOMB PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A B C	Switch	1/2	RV-87-K	BT-3 Not Req. KB-1	A47F1-250K KSS-3 A47F3-2Meg KSS-3	Q13-130X Not Req. 78-1 Q18-139X Not Req.	Loudness, Tap @ 100K
R2A B	2Meg B	1/2	RV-59-K	BT-3 Not Req. KB-1	A47F1-250K KSS-3 A47F3-2Meg KSS-3	Q13-130X Not Req. 78-1 Q18-139X Not Req.	Treble, Tap @ 1,2Meg
R3A B	2Meg B	1/2	RV-57-K	BT-3 Not Req. KB-1	A47F1-250K KSS-3 A47F3-2Meg KSS-3	Q13-130X Not Req. 78-1 Q18-139X Not Req.	Bass
R4 LDR	2	2	RV-75	BT-3 Not Req. KB-1	A47F1-250K KSS-3 A47F3-2Meg KSS-3	Q13-130X Not Req. 78-1 Q18-139X Not Req.	Bass Bung Balance (Wire Wound)

## **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
		NEWCOMB PART No.	IRC PART No.		
R5	560K	RR-34	BTS-560K		
R6	560K	RR-34	BTS-560K		
R7	100K	RR-27	BTS-100K		
R8	58K	RR-25	BTS-56K		
R9	68K	RR-26	BTS-88K		
R10	100K	RR-27	BTS-100K		
R11	22K	RR-21	BTS-22K		
R12	33K	RR-32	BTS-33K		
R13	1.5Meg	RR-39	BTS-1.5Meg		
R14	3.0Meg	RR-31	BTS-270K		
R15	560K	RR-34	BTS-560K		
R16	470K	RR-33	BTS-470K		
R17	820K	RR-36	BTS-820K		
R18	18Meg	RR-140	BTS-18Meg		
R19	270K	RR-31	BTS-270K		
R20	56K	RR-34	BTS-56K		
R21	56K	RR-34	BTS-56K		
R22	82K	RR-133	BTS-82K		
R23	56K	RR-34	BTS-56K		
R24	560K	RR-34	BTS-560K		

Note 1. Some Versions May Use 560K In This Application (Part #RR-34).

## TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PR1.	SEC. 1	SEC. 2	SEC. 3	NEWCOMB PART No.	Hollidson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC 0.55A (@.072A)	660VCT 0.3VAC (@.274A)			TR-175		P-2951 ①		22R02 ①	

① Tape 5V Winding & Center Tap On 6.3V Winding.

## TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES
		NEWCOMB PART No.	Hollidson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	800Ω CT 16Ω Tap @ 8Ω	TR-185	ZI404					

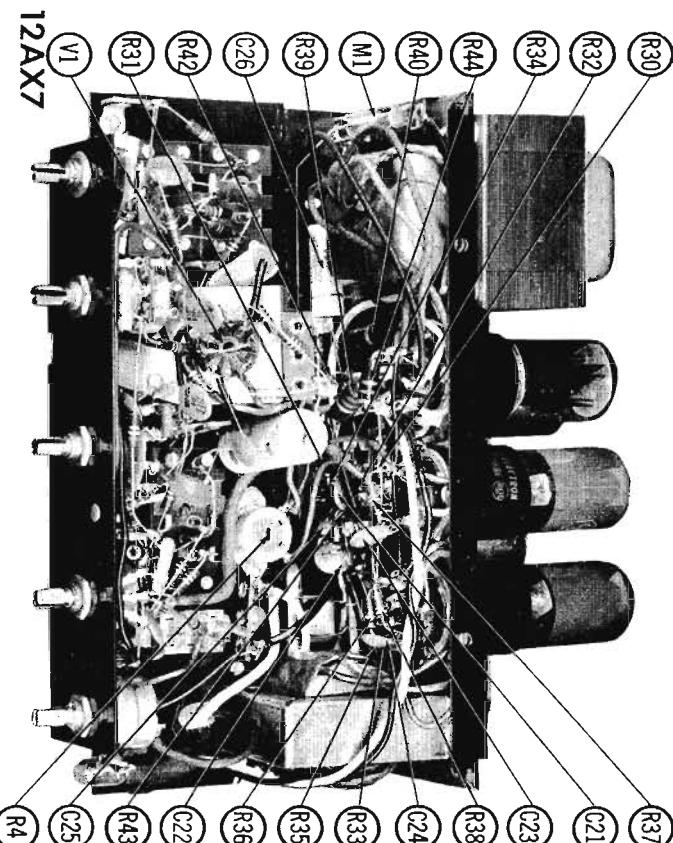
## FUSES

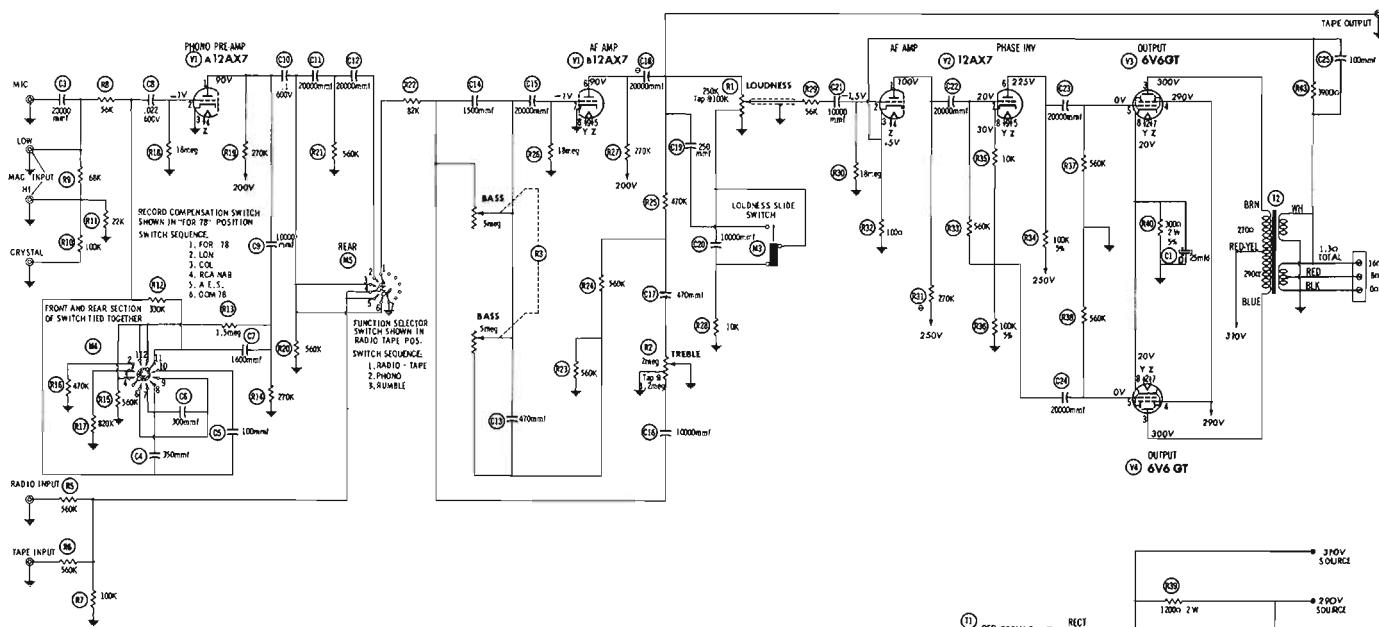
ITEM No.	TYPE	RATING	NEWCOMB PART No.		LITTELFUSE PART No.		BUSS PART No.		NOTES
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER	
M1	3AG	1A 250V S/B	FA-18		313001, (3AG 1A) S/B	357001	MDL1	4405	

## MISCELLANEOUS

ITEM No.	PART NAME	NEWCOMB PART No.	NOTES
M2	Pilot Light		#47
M3	Switch	SY-5	Loudness, Slide Type (SPDT)
M4	Switch	SY-88	Record Compensation, Rotary, Wafer Type
M5	Switch	SY-90	Function Selector, Rotary Wafer Type

## CHASSIS—BOTTOM VIEW

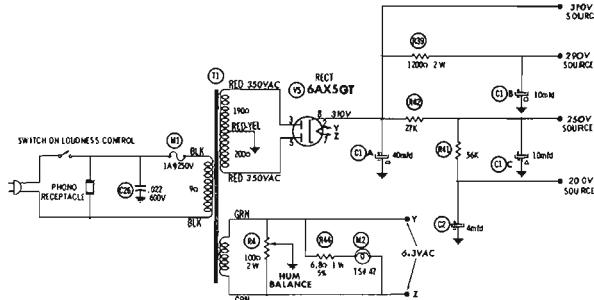




RESISTANCE READINGS								
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AX7	1.75K	1.8Meg	On	140	140	1.35K	1.8Meg
V2	12AX7	1.30K	1.8Meg	100Ω	140	140	1.13K	600Ω
V3	6V6GT	TP	1.27Ω	1.12Ω	540K	NC	140	300Ω
V4	6V6GT	TP	1.29Ω	1.20Ω	540K	TP	140	300Ω
V5	6AV6GT	TP	140	190Ω	TP	200Ω	TP	140

1. MEASURED FROM PIN 8 OF V5.  
NC = NO CONNECTION.  
TP = TEST POINT.

1. DC voltage measurements taken with vacuum tube voltmeter;
2. AC voltages measured at 1000 ohms per volt;
3. Socket connections are shown as bottom views;
4. Measured values are from minimum to maximum reading;
5. Nominal tolerance of component values means possible a variation of +15% voltage and resistance readings;
6. All controls at minimum, proper output load connected.



# PHOTOFAC<sup>\*</sup> Folder



## NEWCOMB MODEL CO-1012



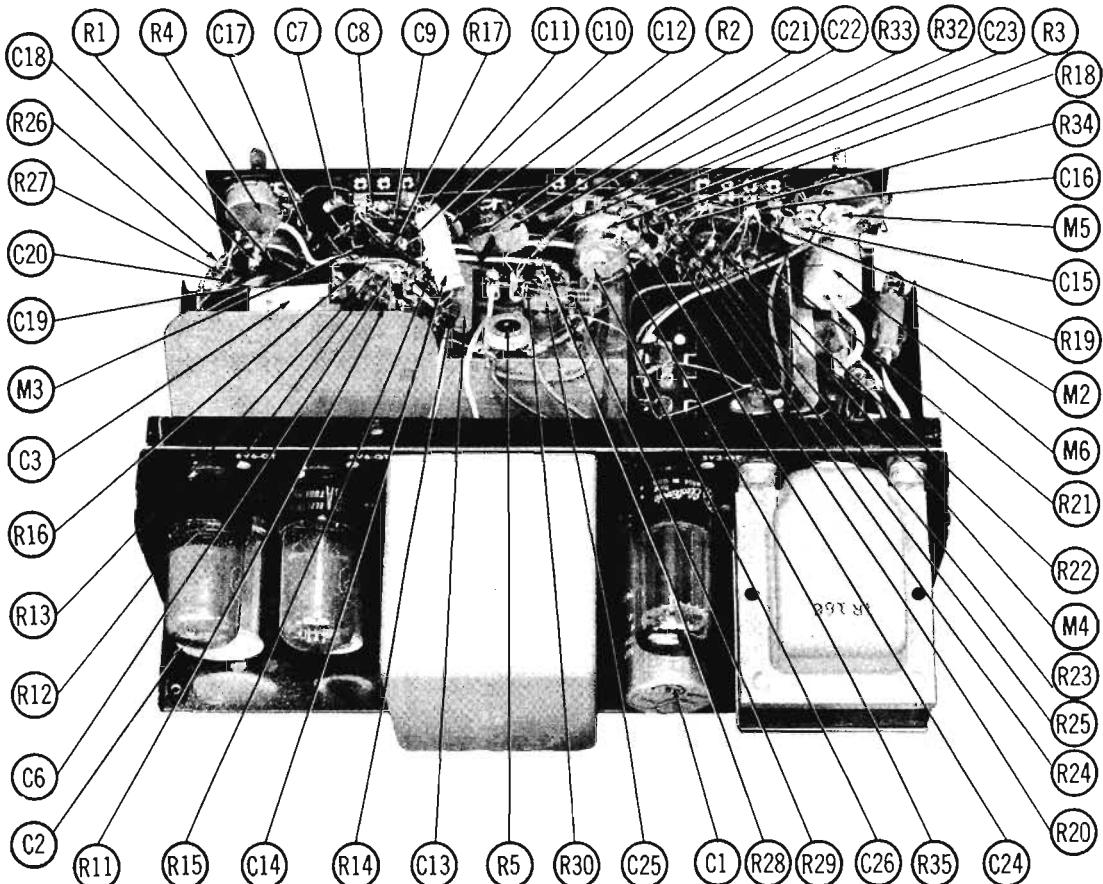
**NEWCOMB  
MODEL CO-1012**

TRADE NAME	Newcomb Model CO-1012	
MANUFACTURER	Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, California	
TYPE SET	AC Operated 7 Channel 12 Watt Audio Amplifier	
TUBES (Six)	Types 12AX7 Mic-Phono Preamplifier, 6AV6 AF Amplifier, 12AX7 AF Amp. -Phase Inv. (2) 6V6GT Output, 5Y3GT Rectifier	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING .64 Amp. @ 117 Volts AC (68 Watts)

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CHASSIS TOP VIEW

## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Mic-Phono Preamplifier	12AX7	
V2	AF Amplifier	6AV6	
V3	AF Amplifier-Phase Inv.	12AX7	

ITEM No.	USE	TYPE	NOTES
V4	Output	6V6GT	
V5	Output	6V6GT	
V6	Rectifier	SY3GT	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	NEWCOMB PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAUKE PART No.
C1A	.60	500	CE-33		BOS20	FP284	TMD-92	Q-075	TVL-3839
B	.10	475			LBR3050	FP62	TD-20-500		
C2A	.20	475	CE-30			FP474	TMQ-19	Q-070	
B	.10	475				TC36	TD-25-50	FM-0525	R2405 *
C	.010	475							
D	.05	50							
C3	.4	450	CE-1	PR5450V4	BR445	TC70	TD-4-450	FM-4504	TVA-1702

\* 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.

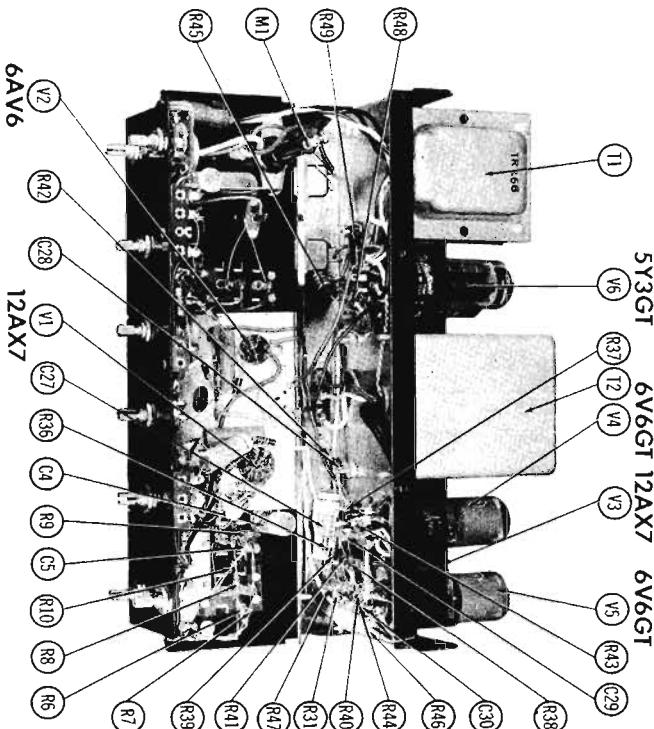
ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	NEWCOMB PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	
C4	.047	600	CP-49	BPD-05	DD-503	BY68547	GP-100	GEM-6147	6TM-S47
C5	.10	600	CP-49	BPD-05	DD-503	CU68547	GP-171	UC-531	SGA-S47
C6	.047	600	CP-49	BPD-05	DD-503	CU68547	GP-100	GEM-6147	6TM-S47
C7	.047	600	CM-3	SI-47	D6-470	LTTQ47	GP-47	UC-5447	SGA-Q47 Note 1
C8	.100		CM-14	SI-100	D6-101	LTTQ1	GP-100	UC-531	SGA-T1 Note 2
C9	.250		CM-22	BPD-00025	DD-251	LJ0725	ED-250	UC-5325	5GA-T25 Note 3
C10	.300		CM-15	SI-300	D6-301	LTTQ3	GP-300	UC-533	5GA-T3
C11	1000		CM-38	SI-1000	D6-102	LTTQ1	GP-1000	DC521	5HK-DI
C12	1600		CM-52	BPD-0015	DD-102	LTTQ1	GP-1500	DC515	5HK-S1000
C13	.032	600	CP-45	BPD-02	DD-103	CU68522	ED-200	GEM-611	6TM-S1
C14	20000		CM-35	BPD-02	DD-203	CU68522	ED-02	GEM-6122	6TM-S22
C15	20000		CM-35	BPD-02	DD-303	BY68652	ED-02	BY68652	5HK-S2
C16	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2
C17	.100		CM-14	SI-100	D6-101	LTTQ1	GP-100	UC-531	SGA-T1
C18	.47		CM-3	SI-47	D6-470	LTTQ47	GP-47	UC-5447	SGA-Q47
C19	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2
C20	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2
C21	10000		CM-35	BPD-01	DD-101	BY68547	ED-01	DC511	5HK-S1
C22	10000		CM-35	SI-1000	D6-102	LTTQ1	GP-1000	DC521	5HK-DI
C23	.470		CM-25	SI-470	D6-471	LTTQ47	GP-470	UC-5347	SGA-T47
C24	.470		CM-25	SI-470	D6-471	LTTQ47	GP-470	UC-5347	SGA-T47
C25	.01	600	CP-45	BPD-01	DD-103	CU68551	GP-10000	GEM-811	6TM-S1
C26	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2
C27	.047	600	CP-49	BPD-05	DD-503	CU68547	ED-01	GEM-6147	6TM-S47
C28	.30		CM-16	SI-30	L1003	ED-30			SGA-Q3
C29	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2
C30	20000		CM-35	BPD-02	DD-203	BY68652	ED-02	BY68652	5HK-S2

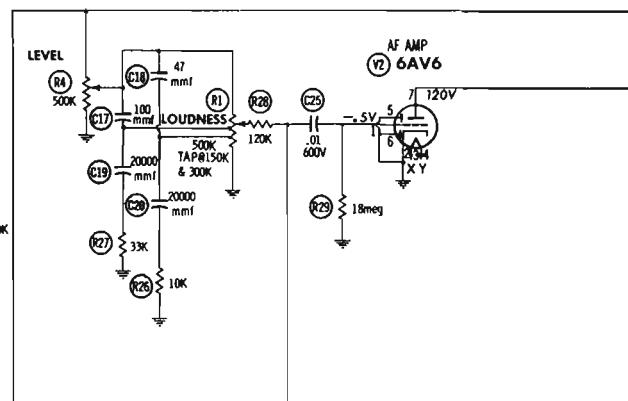
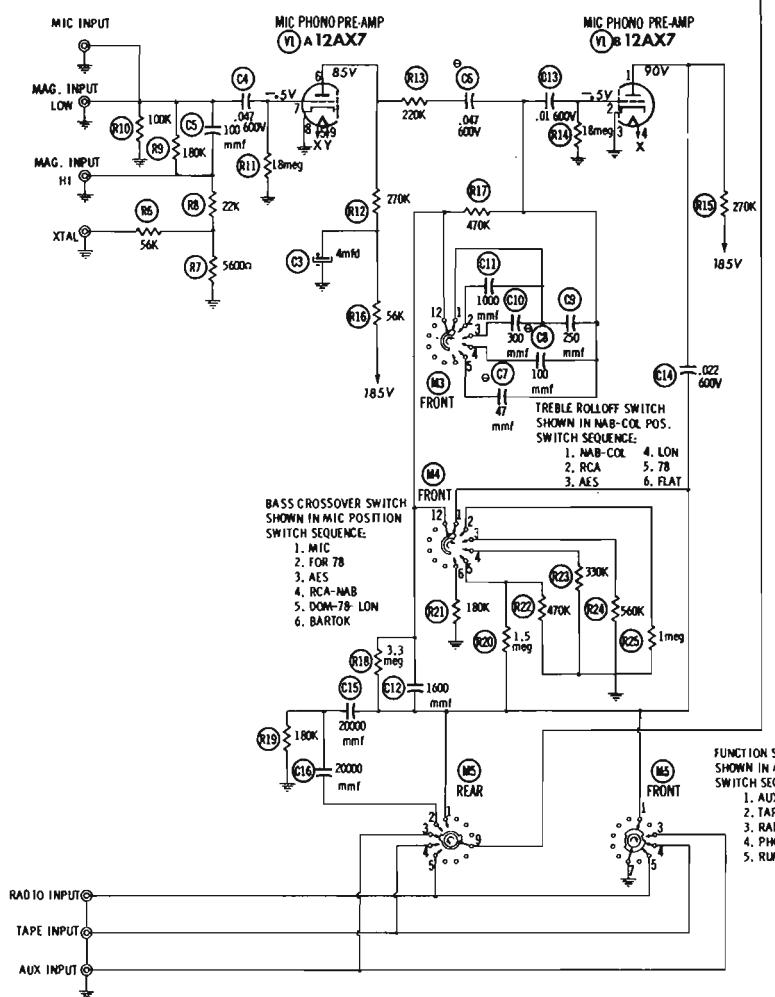
Note 1. Some versions may use .1 MFDF @ 400V in this application.

Note 2. Some versions may use 100 MMF in this application.

Note 3. Some versions may use 150 MMF in this application.

## CHASSIS—TOP VIEW

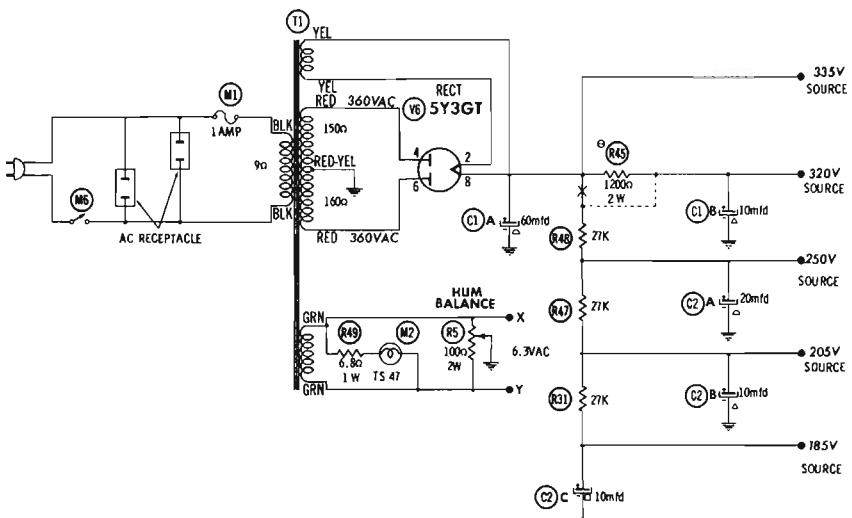
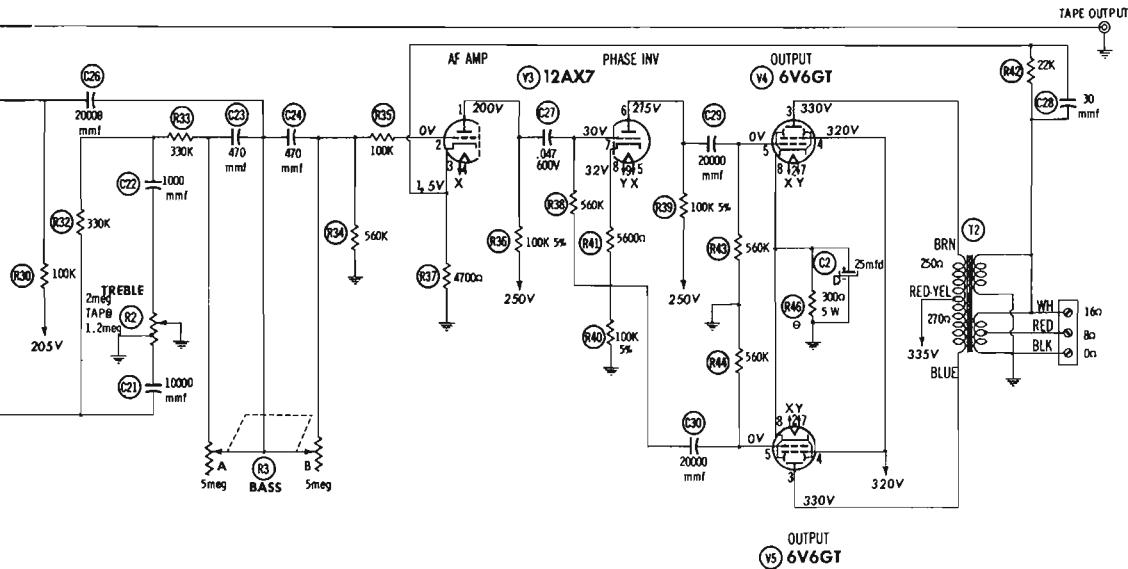




DENOTES  
B- BUSS

DENOTES  
CHASSIS

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
V1	12AX7	1340K	18Meg	0Ω	26Ω	26Ω	1405K	18Meg	0Ω
V2	6AV6	18Meg	0Ω	26Ω	26Ω	0Ω	0Ω	1155K	
V3	12AX7	127Y	660K	4700Ω	26Ω	26Ω	1127K	650K	100K
V4	6V6GT	TP	26Ω	1250Ω	540K	TP	26Ω	300Ω	
V5	6V6GT	TP	26Ω	1270Ω	11200Ω	540K	TP	26Ω	300Ω
V6	5Y3GT	NC	20K (Min)	NC	150Ω	TP	160Ω	NC	20K (Min)

ALL MEASUREMENTS TAKEN IN "AUX" POSITION.  
 † MEASURED FROM PIN 8 OF V6.  
 NC NO CONNECTION.  
 TP TIE POINT.

## PARTS LIST AND DESCRIPTIONS (Continued)

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES	
	RESISTANCE	WATTS	NEWCOMB PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	1/2	RV-71-K	ABT-160			UDT-285	Loudness, Tap @ 150K & 300K
B	Shaft			AK-4			Not Req.	
R2A	2Meg	1/2	RV-59-K		A47F3-2Meg	Q18-139X	UT-451	Treble, Tap @ 1.2Meg
B	1M				KSS-3	Not Req.	Not Req.	
R3A	5Meg	1/2	RV-57-K					Bass
B	5Meg							Bass
R4A	500K	1/2	RV-88-K	B-59	A47-500K-S	Q11-133	U50	Level
B	Shaft		Not Req.	KSS-3	Not Req.	Not Req.		Hum Balance (Wire Wound)
R5	100G	2	RV-75					

## RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	OHMS	WATT	NEWCOMB PART No.	IRC PART No.		REPLACEMENT DATA	
					OHMS	WATT	
R6	50K		RR-25	BTS-50K	R28	120K	RR-28
R7	5600Ω		RR-15	BTS-5600	R29	18Meg	BTS-18Meg
R8	22K		RR-21	BTS-22K	R30	100K	RR-27
R9	180K		RR-29	BTS-180K	R31	27K	RR-22
R10	100K		RR-27	BTS-100K	R32	330K	RR-32
R11	18Meg		RR-140	BTS-18Meg	R33	330K	RR-32
R12	10K		RR-140	BTS-10K	R34	50K	RR-14
R13	220K		RR-30	BTS-220K	R35	100K	RR-27
R14	18Meg		RR-140	BTS-18Meg	R36	100K %	RR-50
R15	270K		RR-31	BTS-270K	R37	4700Ω	RR-14
R16	50K		RR-25	BTS-50K	R38	560K	RR-34
R17	470K		RR-33	BTS-470K	R39	100K %	RR-50
R18	3.3Meg		RR-42	BTS-3.3Meg	R40	100K %	RR-50
R19	180K		RR-29	BTS-180K	R41	500Ω	RR-15
R20	1.5Meg		RR-20	BTS-1.5Meg	R42	22K	BTS-22K
R21			RR-20	BTS-180K	R43	180K	RR-34
R22	470K		RR-33	BTS-470K	R44	560K	RR-34
R23	330K		RR-32	BTS-330K	R45	1200Ω	RR-146
R24	500Ω		RR-34	BTS-560K	R46	300Ω	PWT-300
R25	1Meg		RR-37	BTS-1Meg	R47	27K	RR-22
R26	10K		RR-18	BTS-10K	R48	27K	BTS-27K
R27	33K		RR-23	BTS-33K	R49	6.8Ω	RR-149

Note #1. 250Ω 5 W Used in Some Versions (Part #RR-94).

## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	NEWCOMB PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T1	117VAC ④ .64A	690VCT ④ .078A	5VAC ④ 2A	6.3VAC ④ 1.7A	TR-166	P93IG①		PC8409①	24R02U①	

① Tape Center Tap On 6.3V Winding.

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRL	SEC.	NEWCOMB PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T2	T300Ω	CT	TR-178					

### FUSE

ITEM No.	TYPE	RATING	REPLACEMENT DATA			
			NEWCOMB PART No.	LITTELFUSE PART No.	BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER
M1	3AG Slo/Blo	IA 250V	FA-4		31500IL (3AG Slo/Blo 1A)	B4100I MDL1 HKP

### MISCELLANEOUS

ITEM No.	PART NAME	NEWCOMB PART No.	NOTES
M2	Pilot Light		TS47
M3	Switch	SY-89	Treble Roll-Off, (Rotary Wafer Type)
M4	Switch	SY-89	Bass Cross-Over, (Rotary Wafer Type)
M5	Switch	SY-91	Function Selector (Rotary Wafer Type)
M6	Switch		Power On-Off

# PHOTOFAC<sup>\*</sup> Folder

TRADE MARK



## NEWCOMB MODEL CO-1020



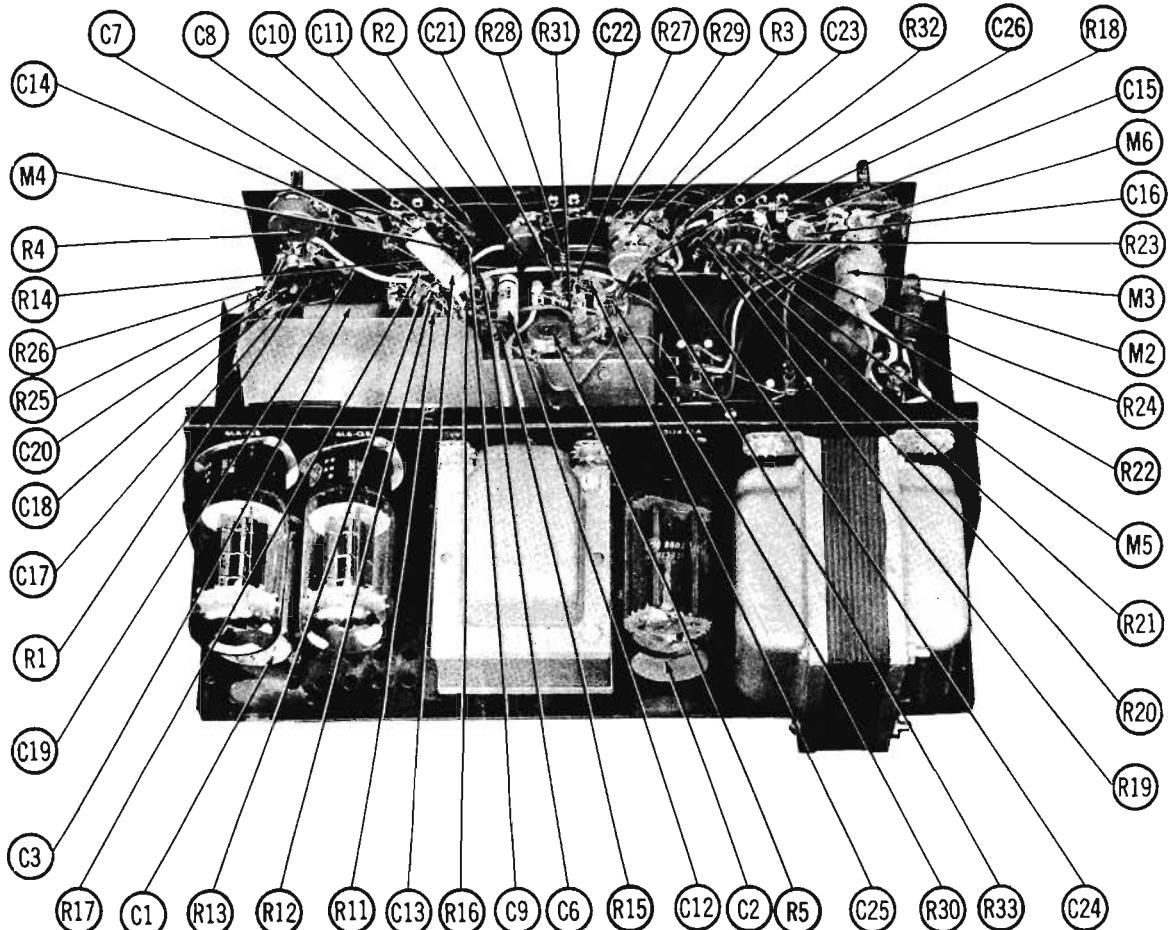
NEWCOMB  
MODEL CO-1020

TRADE NAME	Newcomb Model CO-1020
MANUFACTURER	Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Calif.
TYPE SET	AC Operated 7 Channel 20 Watt Audio Amplifier
TUBES (Six)	Types 12AX7 Preamplifier, 6AV8 AF Amplifier, 12AX7 AF Amp.-Phase Inv., (2) 6L6GB Output, 5U4GA Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles
	RATING .96 Amp. @ 117 Volts AC (105 Watts)

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CHASSIS TOP VIEW

## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Preamplifier	12AX7	
V2	AF Amplifier	6AV6	
V3	AF Amp. -Phase Inv.	12AX7	

ITEM No.	USE	TYPE	NOTES
V4	Output	6L6GB	
V5	Output	6L6GB	
V6	Rectifier	5U4GA	

### ELECTROLYTIC CAPACITORS

ITEM No.	CAP.	VOLT.	REPLACEMENT DATA					
			NEWCOMB PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANDAHO PART No.
C1A	.60	500	CE-33	AFH3-53	D0680		TMT-46	
B	.10	475						R2409 *
C2A	.20	475	CE-30	AFH4-19-10		FP474.5		R2405 *
B	.10	475						
C	.40	475						
D	.20	SD						
C3	.4	450	CE-1	PRS450V4	BR445	TC70	TD-4-450	FM-4504
								TVA-1702

\* 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 CAP. / VOLT	REPLACEMENT DATA						NOTES
		NEWCOMB PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	
C4	100	CM-14	SI 100	D6-101	LTT61	GP-100	UC-531	SGA-TI
C5	.047	600	CP-49	BPD-05	DF-503	CUB6847	GEM-8147	6TM-S47
C6	.047	600	CP-49	BPD-05	DF-504	CUB6847	GEM-8147	6TM-S47
C7	.47		CM-3	SI 47	D6-170	LTT947	GP-47	SGA-Q47
C8	.03		CM-3	SI 47	D6-170	LTT947	GP-100	UC-510
C9	.250		CM-22	SI 250	D6-251	LTT725	GP-250	SGA-T25
C10	.350		CM-26	SI 350	D6-351	LTT635	GP-350	UC-5335
C11	1000		CM-38	SI 1000	D6-102	LTD61	GP-1000	DC521
C12	.01	600	CP-45	BPD-01	DD-103	CUB6851	GP-10000	SHK-DI
C13	.022	600	CP-47	BPD-02	DD-203	CUB68522	ED-02	GEM-8111
C14	1600		CM-52	BPD-0015	DD-151	LTD15	ED-150	6TM-S22
C15	20000		CM-35	BPD-02	DD-203	BYB682	ED-02	SHK-S2
C16	20000		CM-35	BPD-02	DD-203	BYB682	ED-02	SHK-S2
C17	20000		CM-35	BPD-22	DD-203	BYB682	ED-02	SHK-S2
C18	20000		CM-35	BPD-22	DD-203	BYB682	ED-02	SHK-S2
C19	100		CM-14	SI 100	D6-101	LTT61	GP-100	UC-531
C20	.47		CM-3	SI 47	D6-470	LTT947	GP-47	SGA-Q47
C21	10000		CM-32	BPD-01	DD-103	BYA683	ED-.01	DC511
C22	10000		CM-38	BPD-001	DD-103	BYA681	ED-1000	SHK-S1
C23	470		CM-25	SI 47	D6-471	LTT947	GP-470	UC-5347
C24	.47		CM-25	SI 47	D6-471	LTT947	GP-470	SGA-T47
C25	10000		CM-32	BPD-01	DD-103	BYA683	ED-.01	DC521
C26	20000		CM-35	BPD-02	DD-203	BYB682	ED-.02	SHK-S1
C27	.047	600	CP-49	BPD-05	D5-503	CUB6847	GEM-8147	6TM-S47
C28	.001	600	CP-52	P68BN-1	DF-104	CUB68P1	GP-100	UC-531
C29	.1	600	CP-52	P68BN-1	DF-104	LTT61	GP-100	SGA-T1
C30	.1	600	CP-52	P68BN-1	DF-104	CUB68P1	GEM-801	6TM-P1
C31	.250		DM-22	BPD-00025	D6-251	LTT725	GP-250	SGA-T25

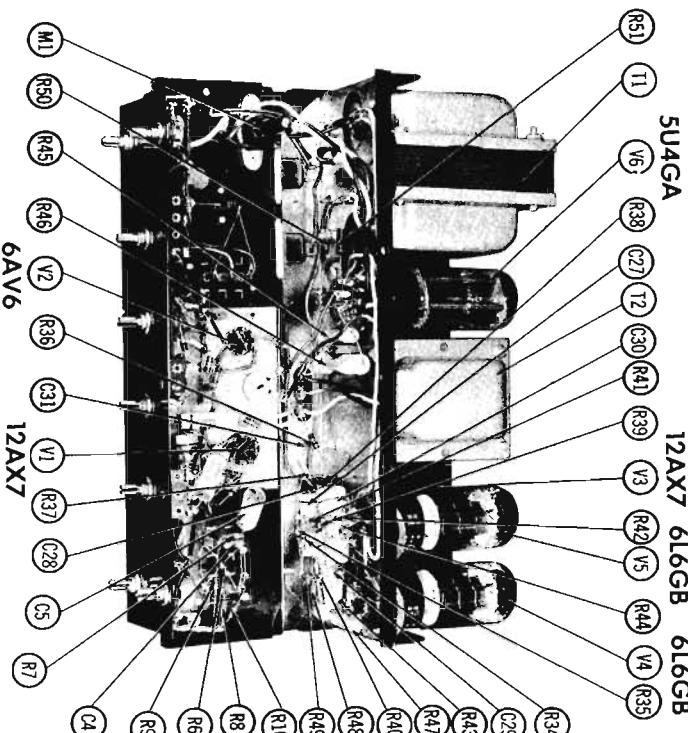
Note 1. Some versions may use .IMFD in this application. (Part #CP-52)

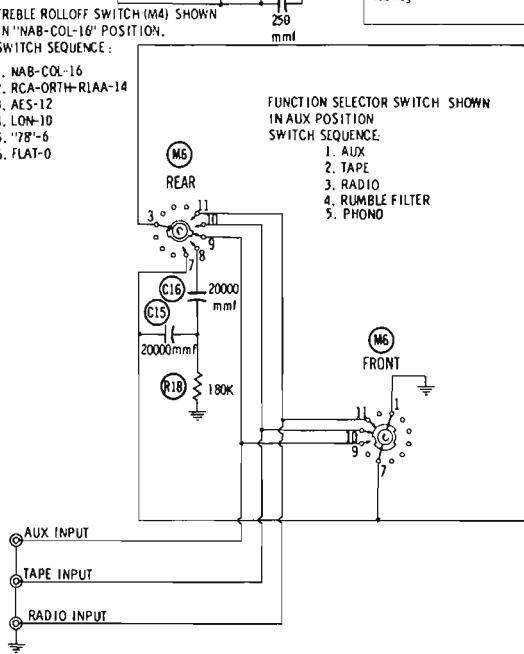
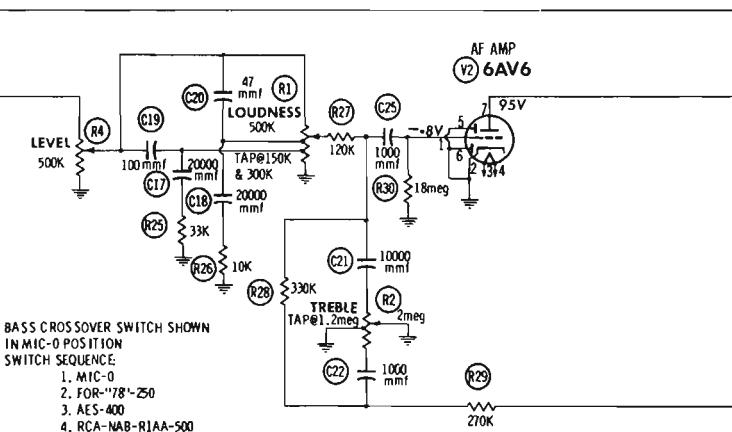
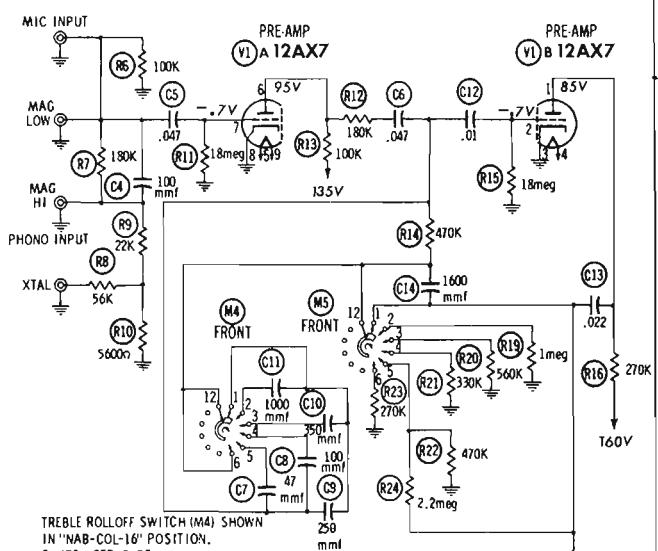
Note 2. Some versions may use 300MMF in this application.

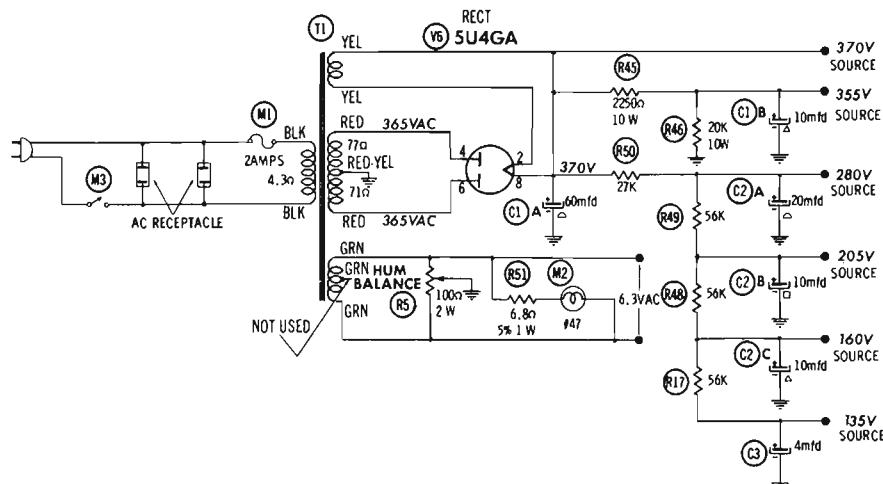
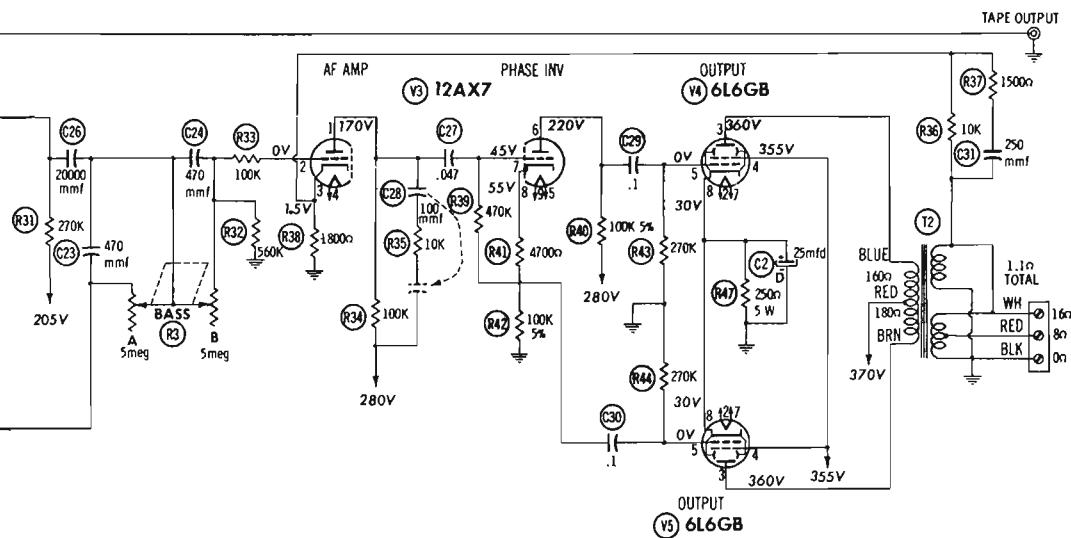
### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	NEWCOMB PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	500K	2Meg	RV-71-K	RV-59-K	A47F3-2Meg	Q18-130X	UDT-285	Loudness, Tap <sup>2</sup> 150K & 300K
R2A					KSS-3	Not req.	UT-451	Treble, L 2Meg
B	Shaft						Not req.	
R3A	5Meg		RV-57-K					
B	5Meg							
R4A	500K		RV-86-K	B-50	A47-500K-S	Q11-133	U50	Base
B	800K				KSS-3	Not req.	Not req.	Level
R5	100K	2	RV-75					Hum Balance

## CHASSIS—TOP VIEW







#### RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	† 40K	18Meg	0n	26n	26n	† 295K	18Meg	0n	26n
V2	6AV6	18Meg	0n	26n	26n	0n	0n	† 355K		
V3	12AX7	† 127K	660K	1800n	26n	26n	† 127K	570K	100K	26n
V4	6L6GB	TP	26n	† 160n	12250n	270K	NC	26n	250n	
V5	6L6GB	TP	26n	† 180n	12250n	270K	TP	26n	250n	
V6	5U4GB	TP	20K(Min)	TP	77n	TP	71n	TP	20K(Min)	

† MEASURED FROM PIN 8 OF V6  
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 pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
- All controls at minimum, proper output load connected.

## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	NEWCOMB PART No.	IRC PART No.	
R6	100K	RR-27	BTS-100K		
R7	180K	RR-29	BTS-180K		
R8	50K	RR-25	BTS-50K		
R9	22K	RR-21	BTS-22K		
R10	5600Ω	RR-15	BTS-5600		
R11	1.6Meg	RR-140	BTS-1.6Meg		
R12	100K	RR-29	BTS-100K		
R13	100K	RR-27	BTS-100		
R14	470K	RR-33	BTS-470K		
R15	18Meg	RR-140	BTS-18Meg		
R16	270K	RR-31	BTS-270K		
R17	55K	RR-25	BTS-55K		
R18	180K	RR-29	BTS-180K		
R19	1.6Meg	RR-37	BTS-1.6Meg		
R20	560K	RR-34	BTS-560K		
R21	330K	RR-32	BTS-330K		
R22	470K	RR-33	BTS-470K		
R23	270K	RR-31	BTS-270K		
R24	2.2Meg	RR-40	BTS-2.2Meg		
R25	33K	RR-23	BTS-33K		
R26	10K	RR-18	BTS-10K		
R27	120K	RR-28	BTS-120K		
R28	330K	RR-32	BTS-330K		

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	NEWCOMB PART No.	Holldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ② .08A	730VCT ③ 122A	5V ④ 3A	8.3VCT ⑤ 2.8A	TR-118	P9318 ①	P-3113 ②	PC8411 ①	24R084 ①	R-14A ②

① Tape Center Tap On 8.3V Winding.

② Drill New Mounting Holes.

## CHASSIS—BOTTOM VIEW

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES	
		PRI.	SEC.	NEWCOMB PART No.	Holldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T2	6300Ω ③ CT	18Ω ④ 8Ω	TR-18I	Z1403 ①	A-3130 ①	A-3307 ①	22568 ①	S-60A ①	① Drill new mounting holes.

### FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			NEWCOMB PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2A	F4-5		31200Z, ③ AG2A	34100I	AGC2	HKP

### MISCELLANEOUS

ITEM No.	PART NAME	NEWCOMB PART No.	NOTES
M2	Pilot Light		#47
M3	Switch	SY-69	ON-OFF
M4	Switch	SY-89	Treble Roll-off
M5	Switch	SY-91	Bass Crossover
M6	Switch		Selector

**PHOTOFAC<sup>\*</sup> Folder**



**PILOT MODEL  
AA-903B**



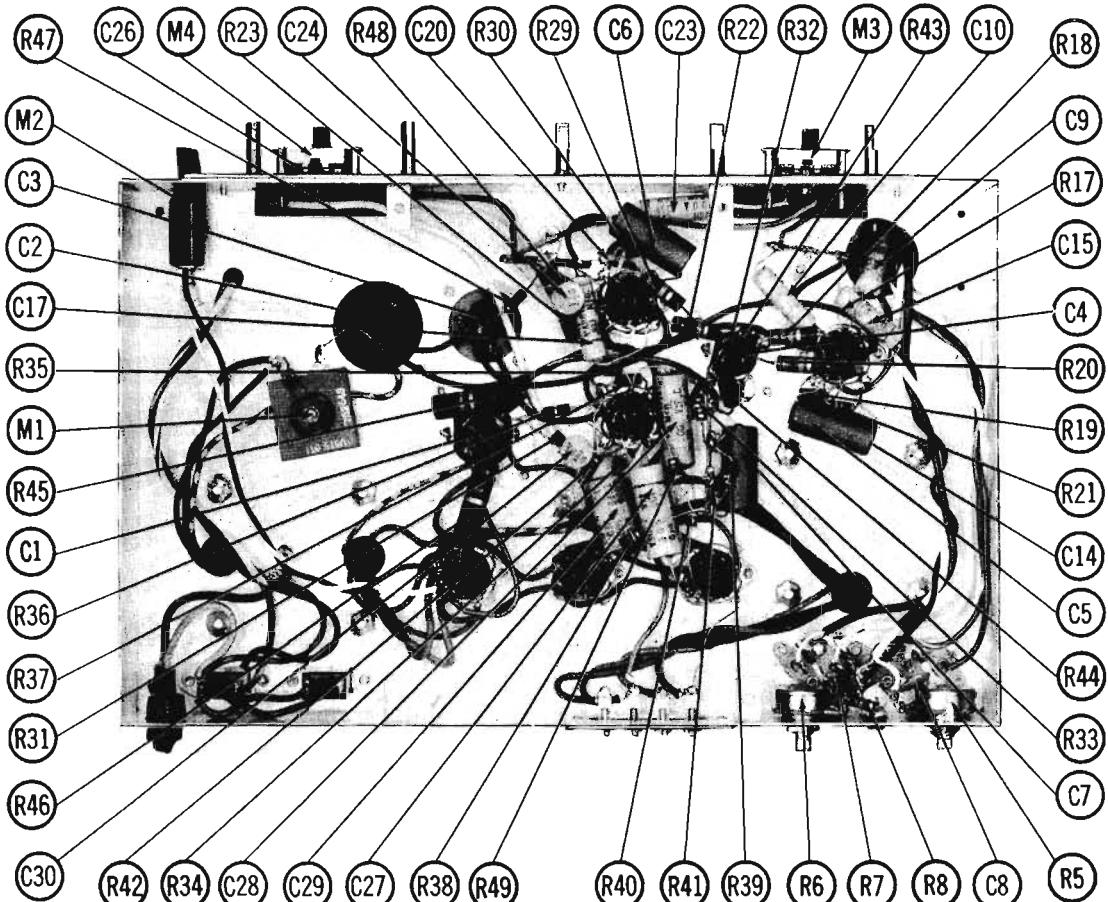
**PILOT MODEL  
AA-903B**

TRADE NAME	Pilot Model AA-903B		
MANUFACTURER	Pilot Radio Corp., 37-06 36th St., Long Island City 1, N. Y.		
TYPE SET	AC Operated 5 Channel Audio Amplifier		
TUBES (Six)	Types 12AX7 Phono Preamplifier, 12AX7 AF Amplifier, 12AX7 AF Amp. - Phase Inv., (2) EL84 (or) 6BQ5 Output, EZ81 (or) 6CA4 Rectifier		
POWER SUPPLY	105-120 Volts AC-60 Cycles	RATING	.72 Amp. @ 117 Volts AC (71 Watts)

**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 H63

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CHASSIS-BOTTOM VIEW

## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Phono Preamplifier	12AX7	
V2	AF Amplifier	12AX7	
V3	AF Amp. - Phase Inv.	12AX7	

Note 1. Alternate Type 6BQ5

ITEM No.	USE	TYPE	NOTES
V4	Output	EL84	Note 1
V5	Output	EL84	Note 1
V6	Rectifier	EZ8I	Note 2

Note 2. Alternate Type 6CA4

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA					
		PIL-OT PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.
C1A	±20 350	24-153	AFH4-14	D0130	FP444	TMQ-12	Q-040
B	±20 350						TVL-4763
C	±20 350						
D	±20 350						
C2	500 25	24-152	AFH1-08	A0120	WP057	TMS-10	S-040
C3	100 25	24-154	AFH1-21	XAO241	WP055	TMS-9	S-035
C4A	±10 350	24-151	AFH3-28	C0220	FP259	TMT-28	S-215
B	±40 350						MT-4510
C5	25 25	24-50	PRRS25V25	BBR25-25	TC26	TD-25-25	MT-0225
C6	25 25	24-50	PRRS25V25	BBR25-25	TC26	TD-25-25	MT-0225
C7	25 25	24-50	PRRS25V25	BBR25-25	TC26	TD-25-25	MT-0225

① Not used in some versions.

### FIXED CAPACITORS

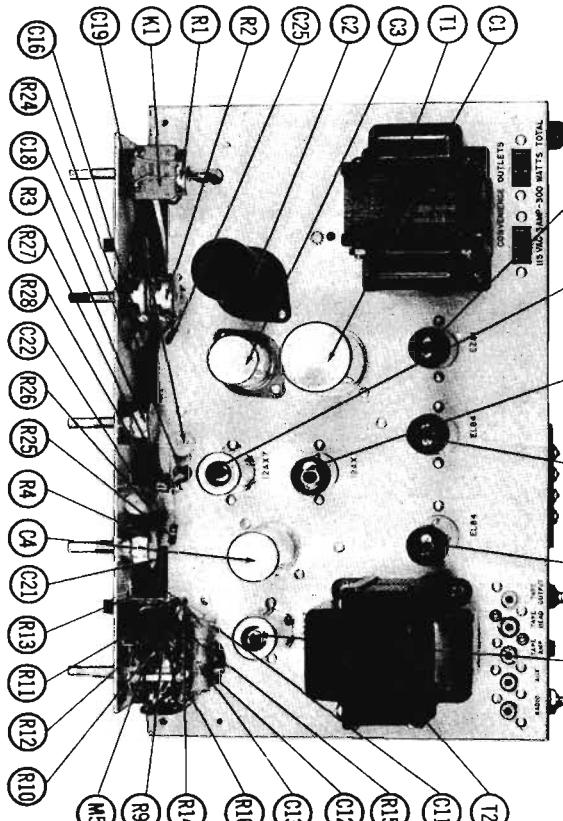
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING	REPLACEMENT DATA						NOTES
		PIL-OT PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	
C8	250 .033 400	BPD-03	DF-308	CUB6533	CUB6522	ED-02	GEM-4133	N1500 10%
C10	.022 400	BPD-02	DD-203	DD-302	DD-303	ED-002	GEM-4122	4TM-S22
C11	.0051 400	BPD-005	DD-302	CUB6522	CUB6533	GP-5000	GEM-4135	6TM-S22
C12	.032 400	BPD-02	DD-203	DD-302	DD-303	ED-02	GEM-4122	4TM-S22
C13	.032 400	BPD-02	DD-203	DD-302	DD-303	ED-02	GEM-4122	4TM-S22
C14	.000 400	BPD-0008	DD-801	LUT16	CUB4522	ED-02	SGA-78	
C15	.022 400	BPD-02	DD-203	DD-302	DD-303	ED-02	GEM-4122	4TM-S22
C16	.250						GEM-4133	
C17	.033 400	BPD-03	DF-308	CUB6533	CUB6522	ED-02	6TM-S33	
C18	50						SHK-D1	
C19	1000	BPD-001	TCN-50	CIOQSU	TC7-50	ED-1000	ZTC-5588	
C20	6.8	NPO-01	TCN-50	TC7-50	TC7-50	ED-1000	TC7-5588	
C21	12.0						TC7-5588	
C22	.047 400	BPD-05	DT-503	DT-502	DT-502	ED-002	TC7-5588	
C23	.033 400	BPD-03	DT-503	DT-502	DT-502	ED-002	TC7-5588	
C24	1500	1464-0015	IRD15	IRD15	IRD15	ED-100	TC7-5588	
C25	100	BPD-0001	DD-101	LUT16	IRD15	ED-100	TC7-5588	
C26	1500	1464-0015	IRD15	IRD15	IRD15	ED-100	TC7-5588	
C27	1 400	1464-0015	TCN-150	TCN-150	TCN-150	ED-100	TC7-5588	
C28	.1 200	P48EN-1	DF-104	CUB2P1	CUB2P1	ED-100	TC7-5588	
C29	.1 400	P48EN-1	DF-104	CUB2P1	CUB2P1	ED-100	TC7-5588	
C30	150	P48EN-1	DT-502	DT-502	DT-502	ED-100	TC7-5588	

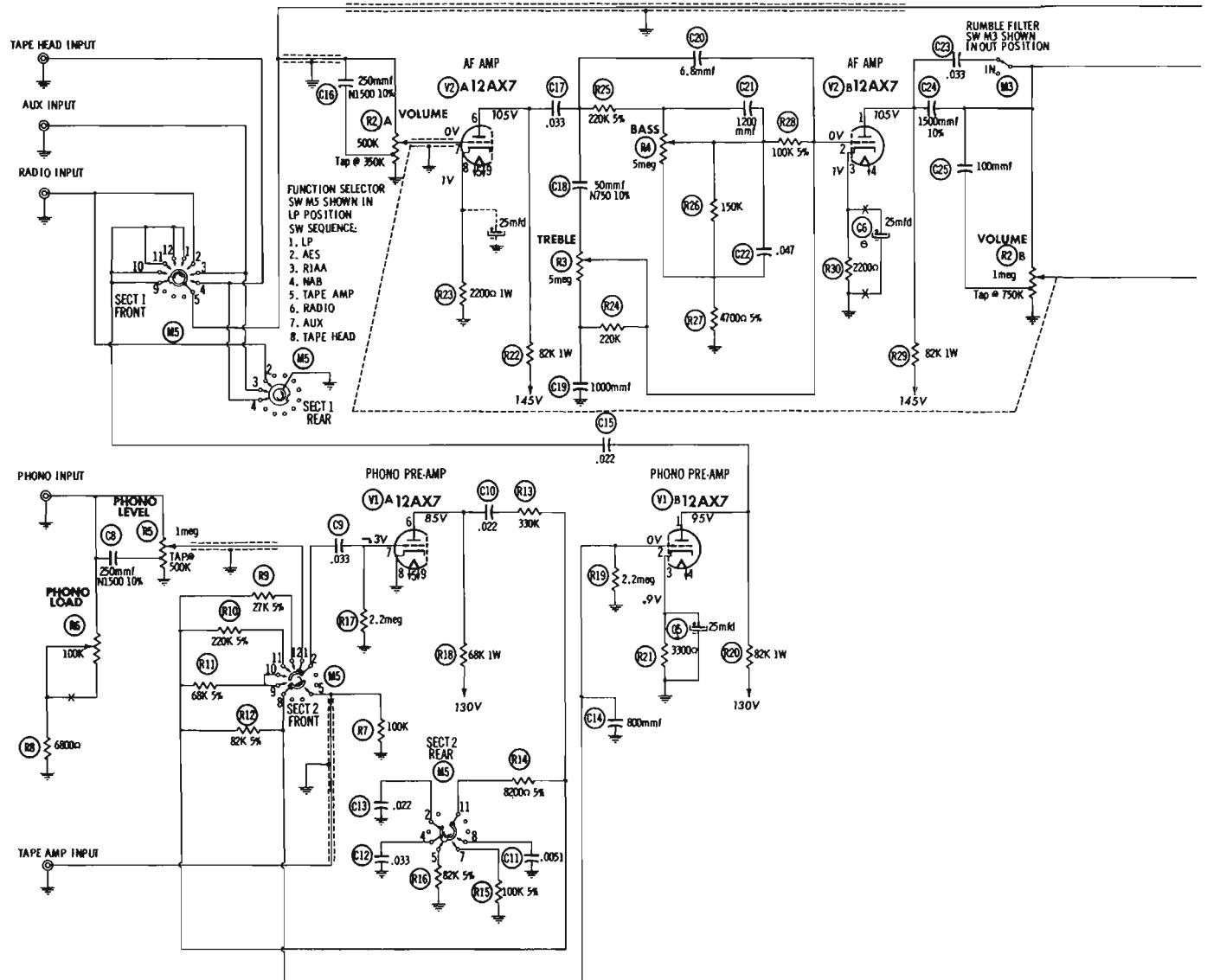
### CONTROLS

ITEM No.	RATING	REPLACEMENT DATA					
		PIL-OT PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	36-66	C1709				Loudness, Tap @ 400K & 760K
B	Switch						
R2A	500K	36-65					Volume, Tap @ 350K
B	1Meg						Volume, Tap @ 750K
R3A	5Meg	37-35	B-87	A47-5Meg-S	Q1U-141	U87	Treble
B	Shaft						
R4A	500K	37-35	Not Req.	A47-5Meg-S	Q1U-141	Not Req.	Bass
B	Shaft						
R5A	1Meg	39-41	ABT-74	FS-3	Q19-137X	UT-443	Phono Level, Tap @ 500K
B	Shaft						Phono Load
R6A	100K	39-32	Not Req.	A47-100K-S	Q1U-128	U41	
B	Shaft						

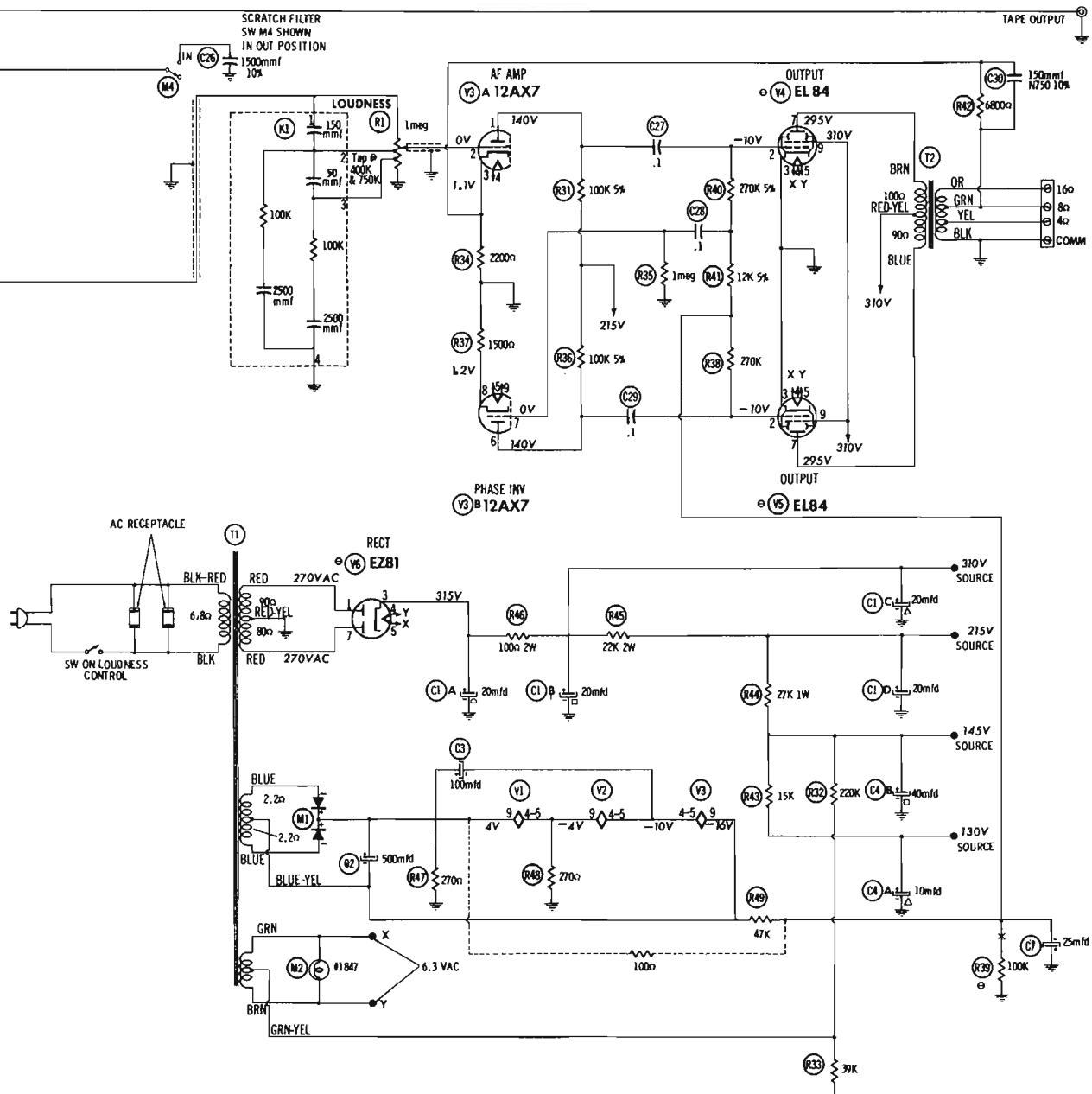
## CHASSIS—TOP VIEW



EZ81 12AX7 12AX7 EL84 EL84 12AX7



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



### RESISTANCE READINGS

REVERSE READING										
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	† 145K	2.2Meg	3300Ω	135Ω	135Ω	1130K	2.2Meg	0Ω	135Ω
V2	12AX7	† 130K	100K	2200Ω	135Ω	135Ω	† 130K	0Ω	2200Ω	135Ω
V3	12AX7	† 120K	0Ω	2200Ω	135Ω	135Ω	† 120K	1Meg	1500Ω	135Ω
V4	EL84	NC	380K	0Ω	35K	35K	NC	† 200Ω	NC	† 100Ω
V5	EL84	NC	370K	0Ω	35K	35K	NC	† 190Ω	NC	† 100Ω
V6	EZ81	90Ω	NC	20K(Mini)	35K	35K	NC	80Ω	NC	NC

ALL MEASUREMENTS TAKEN IN "LP" POSITION  
MEASURED FROM PIN 3 OF V6  
NC NO CONNECTION

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 of component values makes possible a variation of +3% in voltage and resistance readings.
6. All controls at minimum, except output load connected.

SEE PARTS LIST FOR ALTERNATE  
VALUE OR APPLICATION

## PARTS LIST AND DESCRIPTIONS (Continued)

### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA			NOTES
	OHMS	WATT	PILOT PART No.	IRC PART No.		
R7	100K		BTS-100K			
R8	6800Ω		BTS-6800			
R9	27K 5%		BTS-27K 5%			
R10	220K 5%		BTS-220K 5%			
R11	68K 5%		BTS-68K 5%			
R12	82K 5%		BTS-82K 5%			
R13	330K		BTS-330K			
R14	3300Ω 5%		BTS-3300Ω 5%			
R15	100K 5%		BTS-100K 5%			
R16	82K 5%		BTS-82K 5%			
R17	2.2Meg		BTS-2.2Meg			
R18	68K	1	BTA-68K			
R19	2.2Meg		BTS-2.2Meg			
R20	82K	1	BTA-82K			
R21	3300Ω		BTS-3300			
R22	1K		BTA-1K			
R23	2200Ω	1	BTA-2200			
R24	220K		BTS-220K			
R25	220K 5%		BTS-220K 5%			
R26	150K		BTS-150K			
R27	4700Ω 5%		BTS-4700 5%			

Note 1. Not used in some versions.

## TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PR1.	SEC. 1	SEC. 2	SEC. 3	PILOT PART No.	Hollardon PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.
T1	117VAC 0.72A	540VCT 0.108A	0.3VCT 0.2.5A	32VCT 0.320A	55-58					

## TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES	
	PR1.	SEC.	PILOT PART No.	Hollardon PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triod PART No.	
T2	7300Ω CT	16Ω Tsp BD, 4Ω	56-51	ZI405 ①			22866 ①	S-24A ①	Fabricate mounting

## PARTS LIST AND DESCRIPTIONS (Continued)

### COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	PILOT PART No.	REPLACEMENT DATA
K1	Tone Compensation	150MMF, 50MMF, 2600MMF, 2500MMF, 100K, 100K		Centralab PC-325

### SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
		CURRENT (Measured)	PILOT PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	
M1	.320A	110-518	1017	C1B	004B	

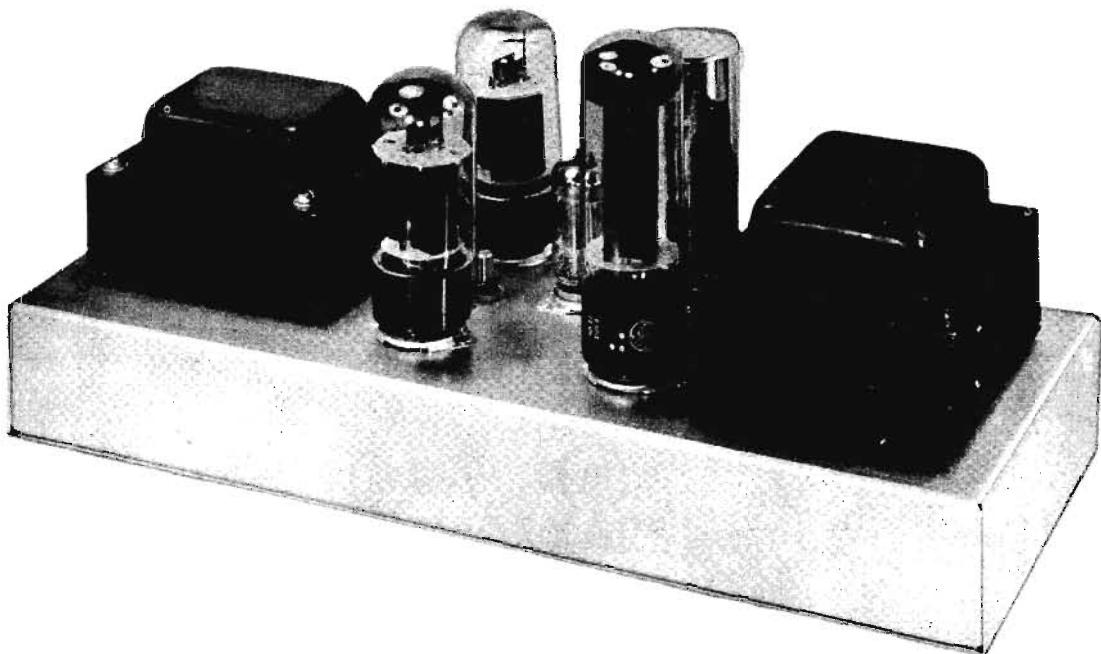
### MISCELLANEOUS

ITEM No.	PART NAME	PILOT PART No.	NOTES
M2	Pilot Light	68-10	#1847
M3	Switch	101-41	Rumble Filter (Slide Type SPST)
M4	Switch	101-41	Scratch Filter (Slide Type SPST)
M5	Switch	100-115	Selector (Rotary Wafer Type)

# PHOTOFAC<sup>\*</sup> Folder



H. H. SCOTT  
MODEL 223



H. H. SCOTT  
MODEL 223

TRADE NAME	H. H. Scott Model 223
MANUFACTURER	Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass.
TYPE SET	AC Operated Audio Amplifier
TUBES (Four)	Types 12AX7 AF Amp.-Phase Inv., (2) 6L6GB Output, 5U4GA Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles.
	RATING .97 Amp. @ 117 Volts AC

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## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amp. - Phase Inv. Output	12AX7 6L5QB	
V2			

ITEM No.	USE	TYPE	NOTES
V3	Output Rectifier	6L6GB 5U4GA	
V4			

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	H. H. Scott PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	.20	475		AFH4-19-20	B6500 B6300	FY475	TMQ-123	Q-075 MT-4720	TVL-4834
B	.20	475							
C	.20	475							
D	.20	475							
C2	.50	100		PRSI50V50	BR6015	TC49	TD-50-150	FM-1550	TVA-1414

### 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. H. Scott PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.0068	400		BPD-0068	D6-682	CUB6D68		GEM-6288	8TM-068	
C4	.0027	400		BPD-0025	D6-272			UC-531	SGA-T1	
C5	.100			BPD-0001	DD-101	G042	ED-100	UC-531	6HK-S2	
C6	30000			BPD-02	DD-203	K085	ED-02	GEM-4147	4TM-847	
C7	.047	400		BPD-05	DF-503	CUB4547	ED-330	UC-5333	SGA-T33	
C8	.330			BPD-00033	DD-331	G056		GEM-4147	4TM-847	
C9	.047	400		BPD-05	DD-503	CUB4547				

### CONTROLS

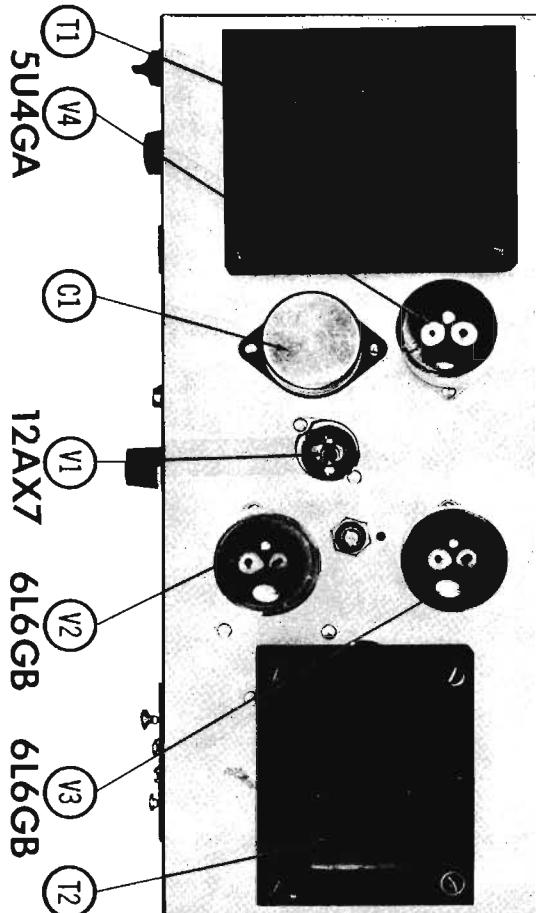
ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES	
	RESISTANCE	WATTS	H. H. Scott PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.		
R1A	500K Shaft	1			B-80 Not Req. AB-31 AK-1	A47-500K-Z RS-2 A47-50K-S FKS-1/4	Q3-133 Not Req. Q1-123 RQ	U48 Not Req. SU-35 Not Req.	Level Balance
R2A	50K Shaft	1							

### RESISTORS

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

ITEM No.	RATING		REPLACEMENT DATA			REPLACEMENT DATA			NOTES	
	OHMS	WATT	H. H. Scott PART No.	IRC PART No.	NOTES	ITEM No.	OHMS	WATT	H. H. Scott PART No.	IRC PART No.
R3	2.2Meg			BTS-2.2Meg		R14	88000		BTS-8800	
R4	100K	1		BTA-100K		R15	10000		BTS-1000	
R5	220K			BTS-220K		R16	330K		BTS-330K	
R6	1800Ω			BTS-1800		R17	10000		BTS-1000	
R7	12K			BTS-12K		R18	180Ω	5	PW7-150	
R8	2.2Meg			BTS-2.2Meg		R19	25Ω	10	1 3/4-25K	
R9	100K	1		BTA-100K		R20	3300Ω	2	BTS-3300	
R10	270K			BTS-270K		R21A	33Ω	4	B	180Ω
R11	1500Ω			BTS-1500		R21B	150Ω	5	C	1500Ω
R12	12K			BTS-12K		R21C	33Ω	2		
R13	330K			BTS-330K						

### CHASSIS—TOP VIEW



## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	B. H. Scott PART No.	Halliderson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ① .97A	700VCT ② .130A	5VAC ③ 3A	6.3VCT ④ 2.1A	TR-10-3	P9315	P-2053①	PM841①	22R07	R-168①

① Fabricate mounting.

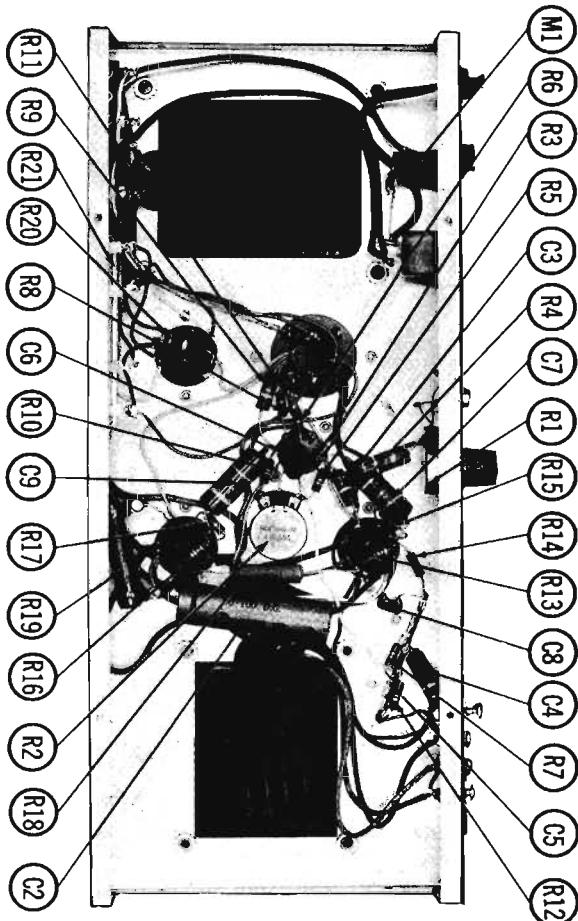
### TRANSFORMER (AUDIO OUTPUT)

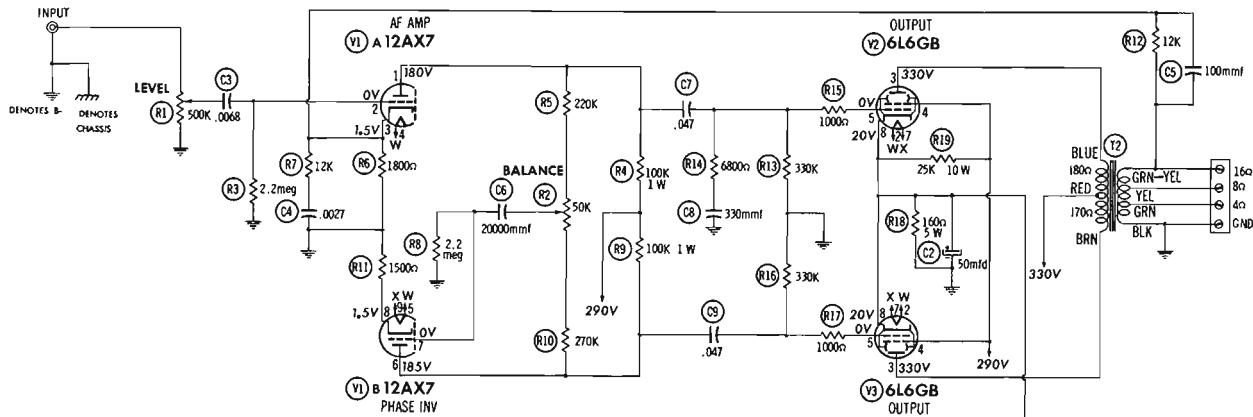
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	B. H. Scott PART No.	Halliderson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T2	7500Ω CT	16Ω tap④ 8Ω, 4Ω	TRA-10-14					

### FUSES

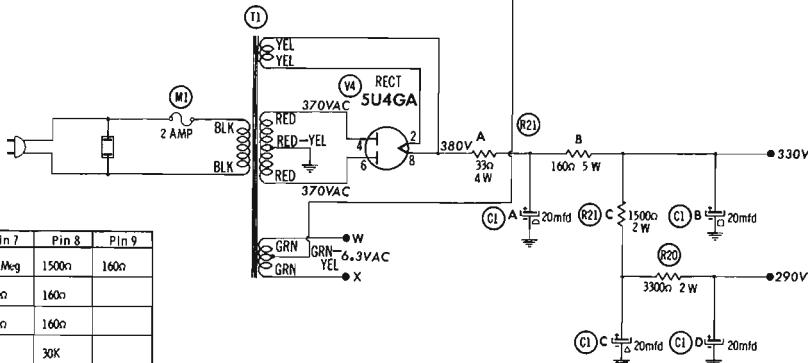
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			B. H. Scott PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	2A			313002, (3AG S/B 2A)	342003.	MDL2	HKP

### CHASSIS—BOTTOM VIEW





1. DC voltage measurements taken with vacuum tube voltmeter;
2. AC voltages measured at 1000 ohms per volt.
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. All controls at minimum, proper output load connected.



#### RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12AX7	$\dagger 85K$	2.2Meg	1800 $\Omega$	160 $\Omega$	160 $\Omega$	$\dagger 85K$	2.2Meg	1500 $\Omega$	160 $\Omega$
V2	6L6GB	TP	160 $\Omega$	$\dagger 3750$	$\dagger 5000$	330 $\Omega$	TP	160 $\Omega$	160 $\Omega$	
V3	6L6GB	TP	160 $\Omega$	$\dagger 365$	$\dagger 5000$	330 $\Omega$	TP	160 $\Omega$	160 $\Omega$	
V4	5U4GA	NC	30K	TP	40 $\Omega$	NC	36 $\Omega$	TP	30K	

<sup>1</sup> MEASURED FROM PIN 8 OF V4.  
NC NO CONNECTION.  
TP TIE POINT.

# PHOTOFAC<sup>\*</sup> Folder

TRADE MARK



## SHERWOOD MODEL S-1000-II



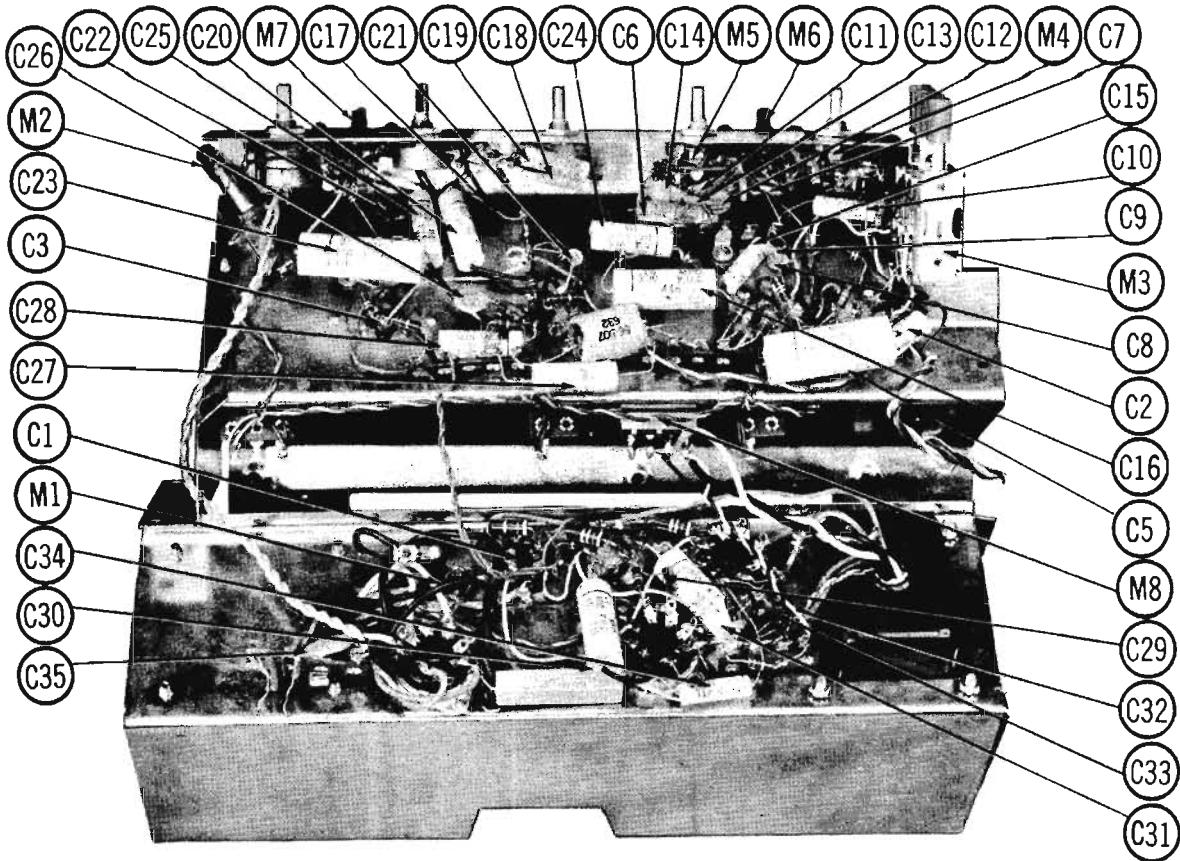
**SHERWOOD**  
**MODEL S-1000-II**

TRADE NAME	Sherwood Model S-1000-II		
MANUFACTURER	Sherwood Electronic Laboratories, Inc., 2802 W. Cullom Ave., Chicago 18, Illinois		
TYPE SET	AC Operated 20 Watt Audio Amplifier		
TUBES (Seven)	Types EF86/6207 (or) Z729 Preamplifier, 12AX7/ECC83 Preamp. - Cath. Follower, 12AX7/ECC83 AF Amplifier, 6BA8A AF Amp. - Phase Inv., (2) 6L6GB Output, 5Y3GT Rectifier		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	.96 Amp. @ 117 Volts AC (100 Watts)

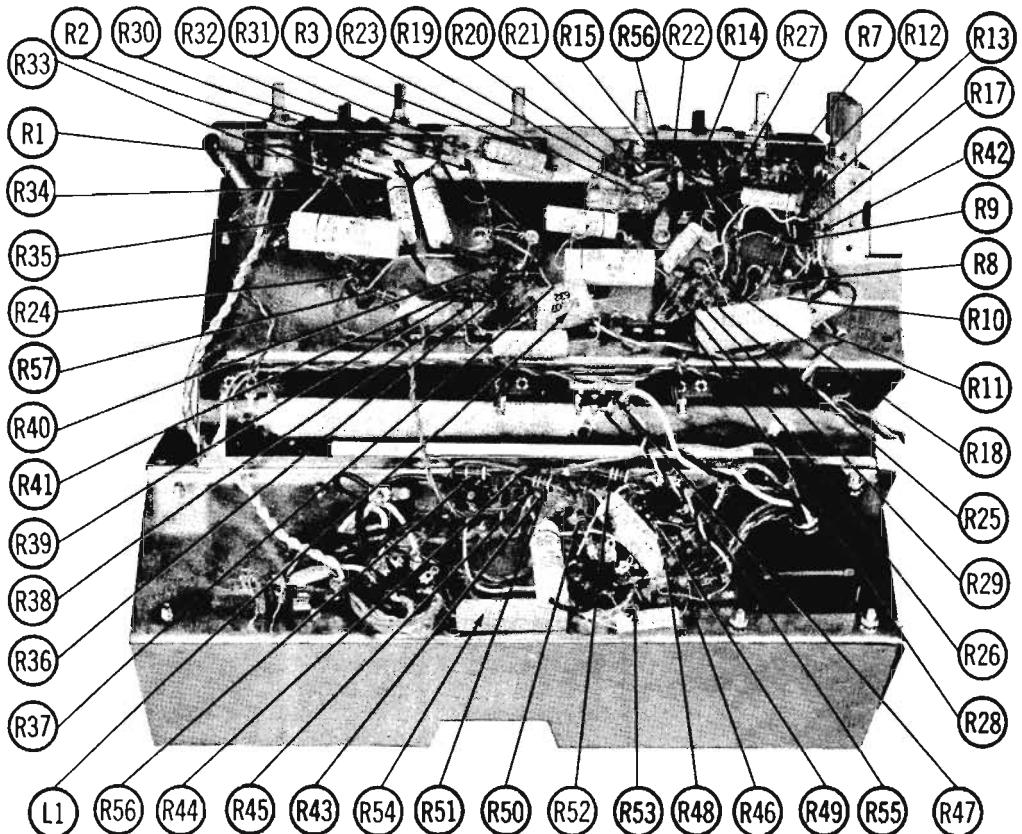
**HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana**

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 H292

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**CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION**



**CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION**

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

ITEM No.	USE	TYPE
V1	Preamplifier	EF66/6267 Note 1
V2	Preamp. - Cath. Follower	12AX7/ECC83
V3	AF Amplifier	12AX7/SCC63
V4	AF Amp. - Phase Inv.	6BA8A

Note 1. Alternate Type 2729

ITEM No.	USE	TYPE
V5	Output	6L6GB
V6	Output	6L6GB
V7	Rectifier	5Y3GT

**ELECTROLYtic CAPACITORS**

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	SHERWOOD PART No.	AEROVOX PART No.	CORNELL-DUBLINER PART No.	MALLORY PART No.	TYRAMID PART No.	SANDAMO PART No.	SPRAGUE PART No.
CLA	.40	400			D0855	FP431-3			
B	.40	400							R2526 *
C	.50	350							
D	.50	50							
C2	.10	400							
C3A	.10	400							
B	.15	400							

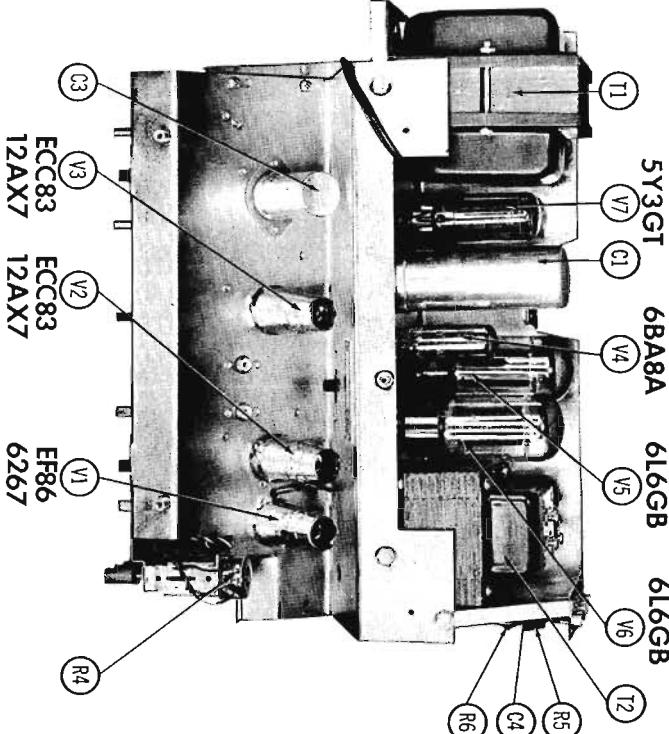
\* Non Catalog Item

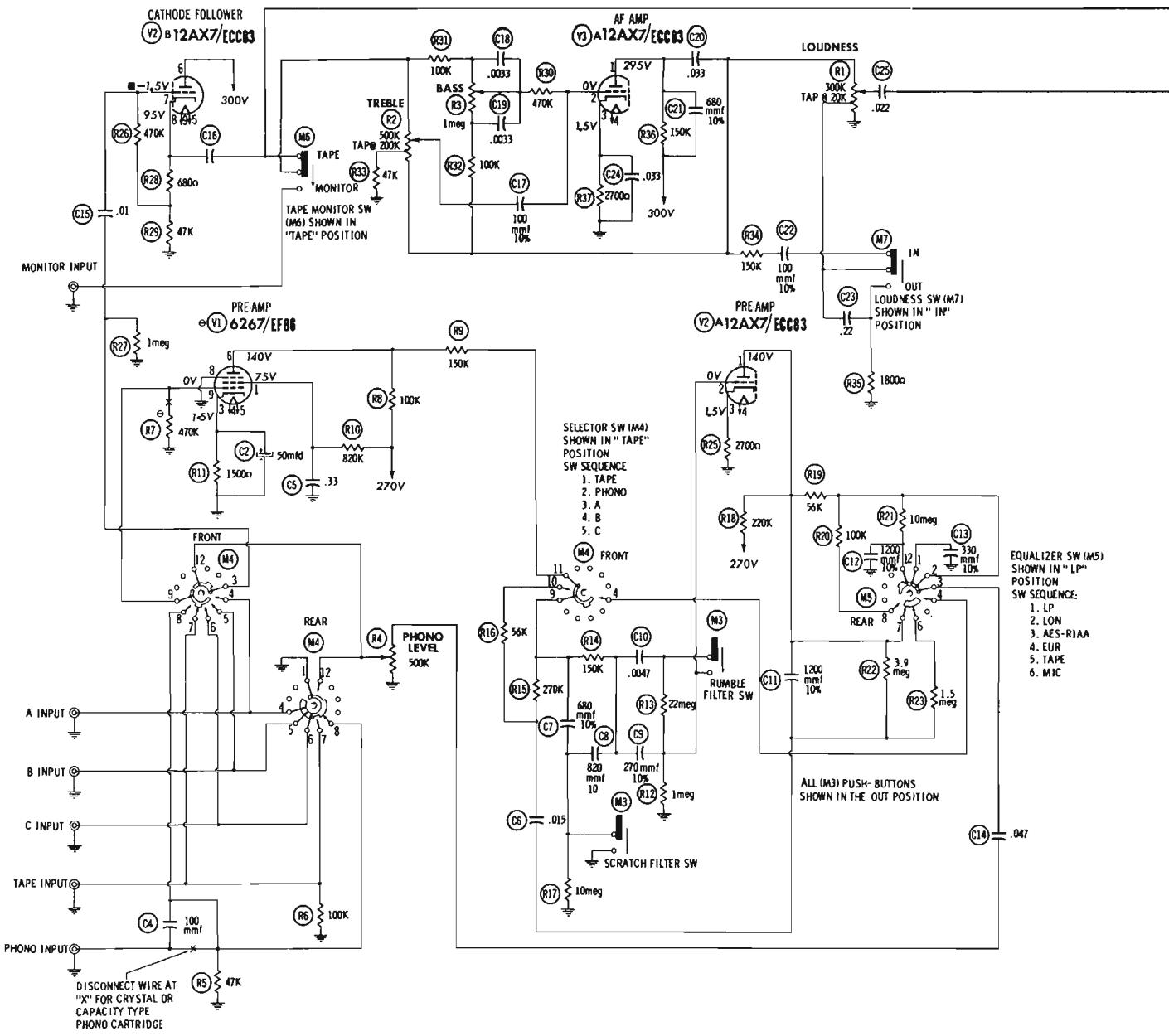
**FIXED CAPACITORS**

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

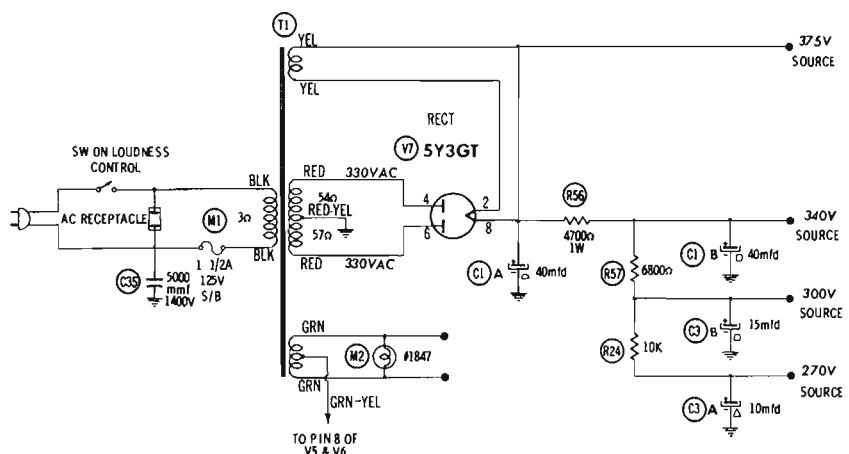
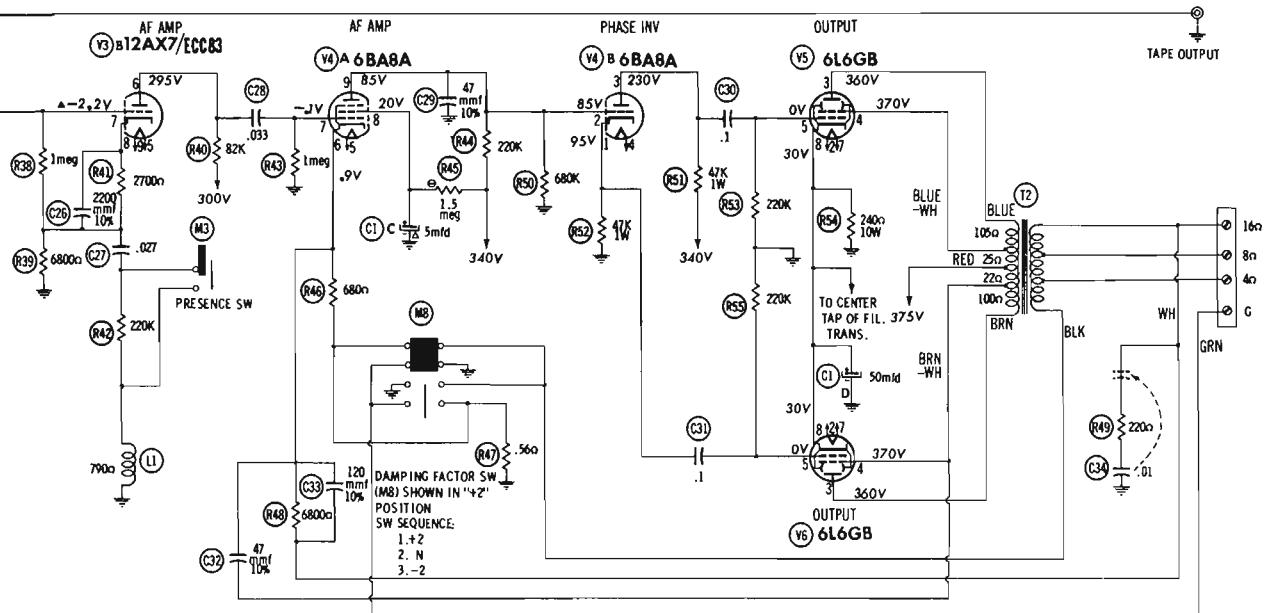
ITEM No.	RATING		REPLACEMENT DATA						NOTES	
	CAP.	VOLT.	SHERWOOD PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBLINER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	.10		1469-0001	D6-101	5W5T1	ED-101	MC235	IFM-31		
C5	.13	200	P288N-33				GEM-2033	4TM-315		
C6	.015	400	P488N-015	D618-153	CUB6815	ED-015	GEM-415	MS-388	10%	
C7	.680			D6-681	IR5768	ED-680		MS-382	10%	
C8	.820				IR5782	ED-820		MS-327	10%	
C9	.270			D6-271	5R5727	ED-270				
C10	.0047	400	P488N-0047	D6-472	CUB647	GP-4700	GEM-6247	6TM-347		
C11	.1200				IR5D12	ED-1200		MS-212	10%	
C12	.1200				IR5D12	ED-1200		MS-212	10%	
C13	.330				IR5D12	ED-330		MS-333	10%	
C14	.047	400	P488N-047	D6-503	CUB647	ED-503	GEM-4147	4TM-347		
C15	.01	400	P488N-01	D6-103	CUB451	OP-10000	GEM-411	4TM-31		
C16	.15	200	P288N-15		CUB2P15		GEM-2015	2TM-315		
C17	.100		1469-0001	D6-101	22R5T1		CY10C101K	MCB235	10%	
C18	.0033	400	P488N-0033	D6-332	CUB6D33	GP-3300	GEM-0233	6TM-333		
C19	.0033	400	P488N-0033	D6-332	CUB6D33	GP-3300	GEM-0233	6TM-333		
C20	.033	400	P488N-033	DF-303	CUB633		GEM-4133	6TM-333		
C21	.880			D6-681	IR5788	ED-680		MS-368	10%	
C22	.00		1469-0001	D6-101	22R5T1	CY10C101K	MCH235	MS-368	10%	
C23	.22	200	P288N-22		CUB6P22		GEM-2022	2TM-322		
C24	.033	400	P488N-033	DF-303	CUB633		GEM-4133	6TM-333		
C25	.022	400	P488N-022	DD-203	CUB4822	ED-02	GEM-4122	4TM-322		
C26	.2200				IR5D22			MS-222	10%	
C27	.027	400	P488N-025		CUB653		GEM-413	4TM-33		
C28	.033	400	P488N-033	DF-303	CUB633		GEM-4133	6TM-333		
C29	.47		1469-000047	D6-470	22R6Q47	CY10C4708	ZT-5447	MS-447	10%	
C30	.1	400	P488N-001	D6-104	CUB4P1		GEM-401	4TM-31		
C31	.47		1469-000047	D6-470	22R6Q47		GEM-401	4TM-31		
C32	.47		1469-000047	D6-470	22R6Q47		ZT-5447	MS-447	10%	
C33	.130		1469-00012	D6-121	22R5T12	ED-120		MS-312	10%	
C34	.01	400	P488N-01	D6-103	CUB481	OP-10000	GEM-411	4TM-31		
C35	5000	1400	DAC-9	DD3-502	HVE16D5	HD18-4700	GEM-1025	BL-D50		

**CHASSIS—TOP VIEW**





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	E9367 6267	1840K	0Ω	1500Ω	240Ω	240Ω	1120K	0Ω	0Ω	85K
V2	12AX7/ ECC83	±240K	1meg	2700Ω	240Ω	240Ω	±11K	520K	47K	240Ω
V3	12AX7/ ECC83	1160K	670K	2700Ω	240Ω	240Ω	±93K	1meg	9500Ω	240Ω
V4	6BA8A	47K	±1160K	152K	240Ω	240Ω	680K	1meg	±2.2meg	1160K
V5	6L6GB	0Ω	240Ω	±130Ω	125Ω	220Ω	240Ω	240Ω	240Ω	
V6	6L6GB	0Ω	240Ω	±122Ω	122Ω	220Ω	0Ω	240Ω	240Ω	
V7	5Y3GT	NC	20K(Min)	NC	54Ω	NC	57Ω	TP	20K(Min)	

f MEASURED FROM PIN 8 OF V7  
 ■ MEASURED FROM PIN 8 OF V2  
 ▲ MEASURED FROM PIN 8 OF V3  
 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 pin to common negative.
- Line voltage maintained at 117 volts for voltage readings.
- Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
- All controls at minimum, proper output load connected.

SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

## PARTS LIST AND DESCRIPTIONS (Continued)

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	SHERWOOD PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A B	300K Switch	1	670AB3					Loudness, Tap @ 20K
R2A B	500K Shaft	1	670ABI	BT-65	A4TF6-500K	Q19-J33X	UT-43I	Treble, Tap @ 200K
R3A B	1meg Shaft	1	670AB2	Not Req.	F8-3	B-69	Not Req.	Bass
R4	500K	1	670AB7	Not Req.	A4T-Imag-3	Q11-J37	U84	Phono Level

### RESISTORS

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

ITEM No.	RATING		SHERWOOD PART No.	NOTES	ITEM No.		RATING	SHERWOOD PART No.	NOTES
	OHMS	WATT			OHMS	WATT			
R5	47K				R31	100K			
R4	100K				R32	100K			
R7	470K			Note 1	R33	47K			
R8	100K				R34	160K			
R9	150K				R35	1800Ω			
R10	820K				R36	150K			
R11	150Ω				R37	2700Ω			
R12	1meg				R38	1meg			
R13	22meg				R39	6000Ω			
R14	3.3MΩ				R40	82K			
R15	2.2KΩ				R41	2700Ω			
R16	5.6K				R42	220K			
R17	10meg				R43	1meg			
R18	220K				R44	220Ω			
R19	50K				R45	1.5meg			
R20	100K				R46	61Ω			
R21	10meg				R47	0.56Ω			
R22	3.3meg				R48	0.600Ω			
R23	5.6meg				R49	220Ω			
R24	10Ω				R50	680K			
R25	2700Ω				R51	47K	1		
R26	470K				R52	47K	1		
R27	1meg				R53	220Ω	10		
R28	680Ω				R54	240Ω			
R29	47K				R55	22K			
R30	470K				R56	470Ω	1		
					R57	6800Ω			

Note 1. Not used in some versions.

Note 2. Some versions may use 2.2meg.

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	SHERWOOD PART No.	Hallidson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T1	117V @ .96A	700VCT @ .125A	5V @ 2A	6.3V @ 2.9A	922ABI					

## PARTS LIST AND DESCRIPTIONS (Continued)

### TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	SHERWOOD PART No.	Hallidson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	
T2	5500Ω	16Ω	920ABI					

### COILS

ITEM No.	USE		REPLACEMENT DATA			NOTES
	SHERWOOD PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.		
L1	Tone Choke					140 Millihenries

### FUSES

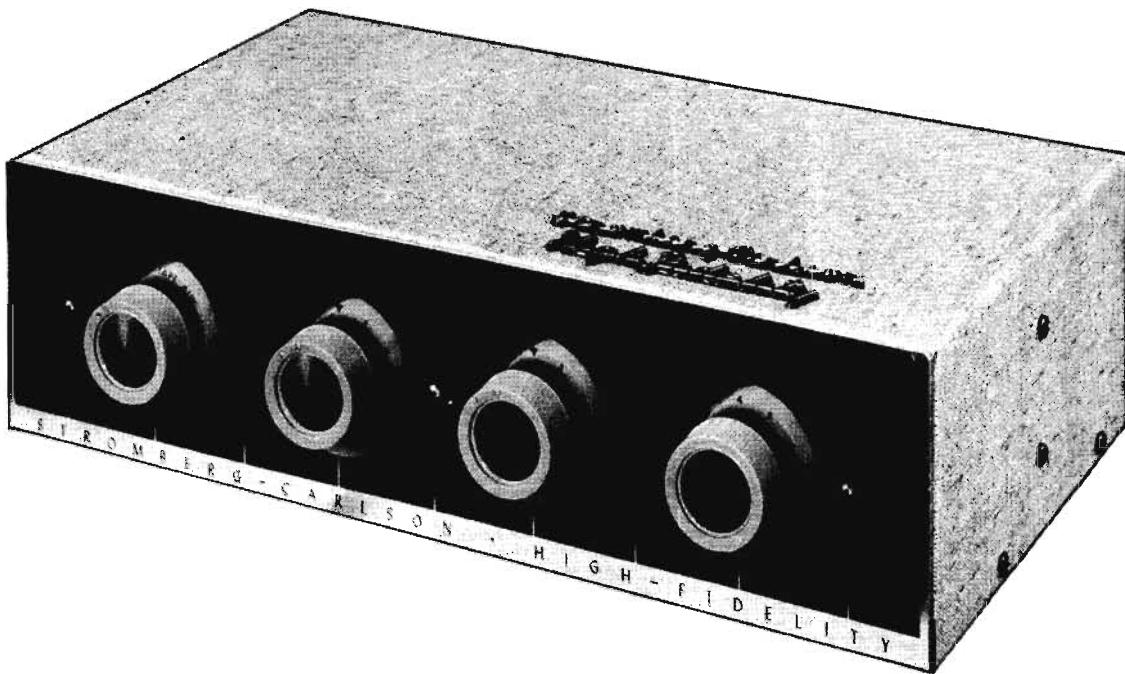
ITEM No.	TYPE	RATING	REPLACEMENT DATA		
			SHERWOOD PART No.	LITELFUSE PART No.	
M1	SAG	1 1/2A 125V S/B		FUSE HOLDER	FUSE HOLDER

### MISCELLANEOUS

ITEM No.	PART NAME	SHERWOOD PART No.	NOTES
M2	Pilot Lamp		#1847
M3	Switch Assem'y		Presence, Scratches Filter, Rumble Filter, Phono Level (Slide Type)
M4	Switch		Selector (Rotary Wafer Type)
M5	Switch		Equalizer (Rotary Wafer Type)
M6	Switch		Tape Monitor (Slide Type SPDT)
M7	Switch		Loudness (Slide Type DPDT)
M8	Switch		Damping Factor (Slide Type DPDT)

### 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 (1 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 AR-411

TRADE NAME	Stromberg-Carlson Model AR-411		
MANUFACTURER	Stromberg-Carlson Co., Service Dept., 1700 University Ave., Rochester 10, N. Y.		
TYPE SET	AC Operated 4 Channel Audio Amplifier		
TUBES (Six)	Types 12AT7 Phono Preamplifier, 12AX7 AF Amplifier, 6AV6 Phase Inverter, (2) 6CM8 Output, 5Y3GT Rectifier		
POWER SUPPLY	105-125 Volts AC-50/60 Cycles	RATING	.68 Amp. @ 117 Volts AC (68 Watts)

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 H237

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## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Phono Preamplifier	12AT7	
V2	AF Amplifier	12AX7	
V3	Phase Inverter	6AV6	

ITEM No.	USE	TYPE	NOTES
V4	Output	6CM6	
V5	Output	6CM6	
V6	Rectifier	5Y3GT	

### ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Stromberg-Carlson PART No.	AEROVOX PART No.	CORNELL-DUBUQUE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAUKE PART No.
C1A	.40	450	35590						
B	.30	350							
C	.15	300							
D	.50	50							
C2A	.20	450	111619	AFH2-69	B0500	FP234	TMD-81	D-225	TVL-2835
B	.20	450	111615-000	PRS25V50	BBR50-6	TC29	TD-50-6	NMT-650	TVL-100
C3	.50	6							

### FIXED CAPACITORS

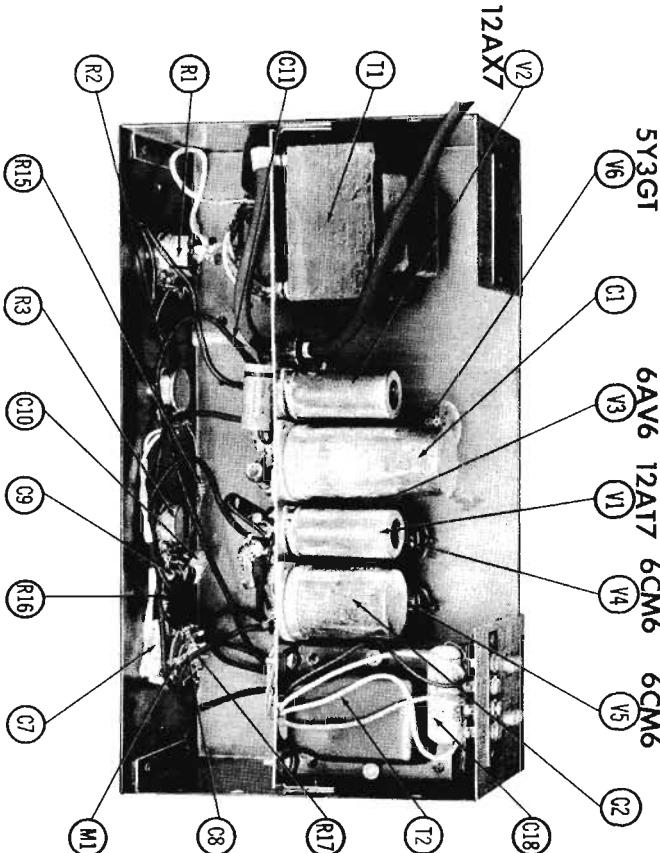
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT.	Stromberg-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBUQUE PART No.	ERIE PART No.	MALLORY PART No.	SPRAUKE PART No.
C4	.01	600	P488N-01	D6-103	CUB681	GP-10000	GEM-611	6TM-31	
C5	.470		SI 470	D6-471	LTT6141	GP-470	GEM-5347	5GA-T47	
C6	.220		SI 220	D6-321	LTT6122	GP-320	GEM-5322	5GA-T22	
C7	.022	400	P488N-022	DD-203	CUB4522	ED-02	GEM-4122	4TM-S22	
C8	.470		SI 470	D6-471	LTT6141	GP-470	GEM-5347	5GA-T47	
C10	.0047	800	P488N-0047	D6-172	CUB61047	GP-4700	GEM-8247	6TM-D47	
C11	.022	400	P488N-022	DD-203	CUB4522	ED-02	GEM-4122	4TM-S22	
C12	.27		SI 27	D6-270	LTT6217	GP-27	GEM-5427	5GA-Q27	
C13	.047	400	P488N-047	DF-503	CUB4547	GP-220	GEM-4147	4TM-S47	
C14	.220		SI 220	D6-321	LTT6122	GP-220	GEM-4147	5GA-T22	
C15	.047	400	P488N-047	DF-503	CUB4547	GP-220	GEM-4147	4TM-S47	
C16	.047	400	P488N-047	DF-503	CUB4547	GP-220	GEM-4147	4TM-S47	
C17	.22	400	P488N-22		CUB4P22		GEM-4022	4TM-P22	

### CONTROLS

ITEM No.	RATING		REPLACEMENT DATA				INSTALLATION NOTES	
	RESIST. ANCE	WAFFTS	Stromberg-Carlson PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K B Shaft	1	145638	B-90-8	A47-500K-8	Q13-133	U4-8	volume
B	Not Req.				FS-2	Not Req.	Not Req.	
C	Switch				SWF-12	76-1	U8-26	
R2A	1Meg B Shaft	1	145639	B-89	A47-1Meg-8	Q11-137	U54	Treble
B	Not Req.				FS-3	Not Req.	Not Req.	
R3A	5Meg B Shaft	1	145630	B-87	A47-5Meg-2	Q13-141	U85	Bass
B	Not Req.				FS-3	Not Req.	Not Req.	
R4A	100K B Shaft	2	145632	WN-101	A43-100	W11-084	R100L	Rum Adj. (Wire Wound)
B	Not Req.				FKS-1/4	SK5-K11	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
	OHMS	WATT		
R5	1Meg			
R6	1Meg			
R7	1Meg			
R8	47K			
R9	10K			
R10	5600Ω			
R11	390K			
R12	470K			
R13	220K			
R14	5600Ω			
R15	47K			
R16	100K			
R17	470K			
R18	220K			
R19	6800Ω			

### TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	Stromberg-Carlson PART No.	Hallidソン PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Triod PART No.
T1	117VAC ③ .88A	620VCT ③ .170A	5VAC ③ 2A	6.3VAC ③ L 8A	161708 ①					

① Used in series 105A and later. Part #161709 used in series 105 and earlier.

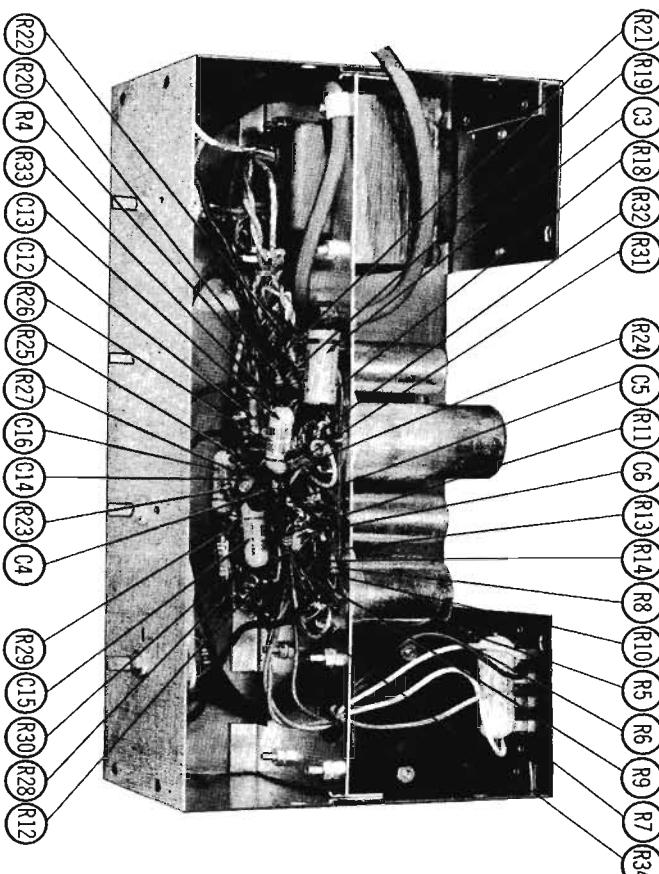
### TRANSFORMER (AUDIO OUTPUT)

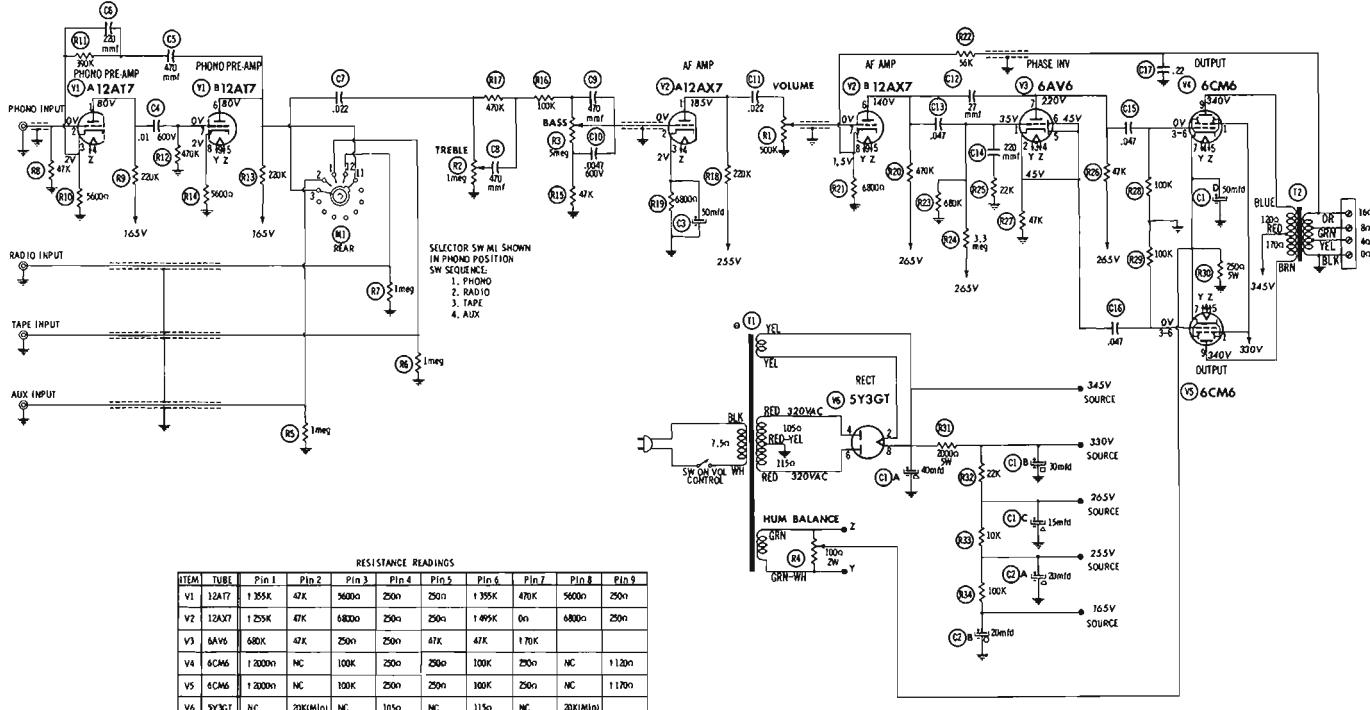
ITEM No.	IMPEDANCE	REPLACEMENT DATA						NOTES
		Stromberg-Carlson PART No.	Hallidソン PART No.	Merit PART No.	Stancor PART No.	Thorderson PART No.	Triod PART No.	
T2	6500Ω CT 180 Tao 8Ω, 4Ω	161345			A-3304	22368		

### MISCELLANEOUS

ITEM No.	PART NAME	Stromberg-Carlson PART No.	NOTES
M1	Switch	158682	Selector (Rotary Water Type)

### CHASSIS—BOTTOM VIEW



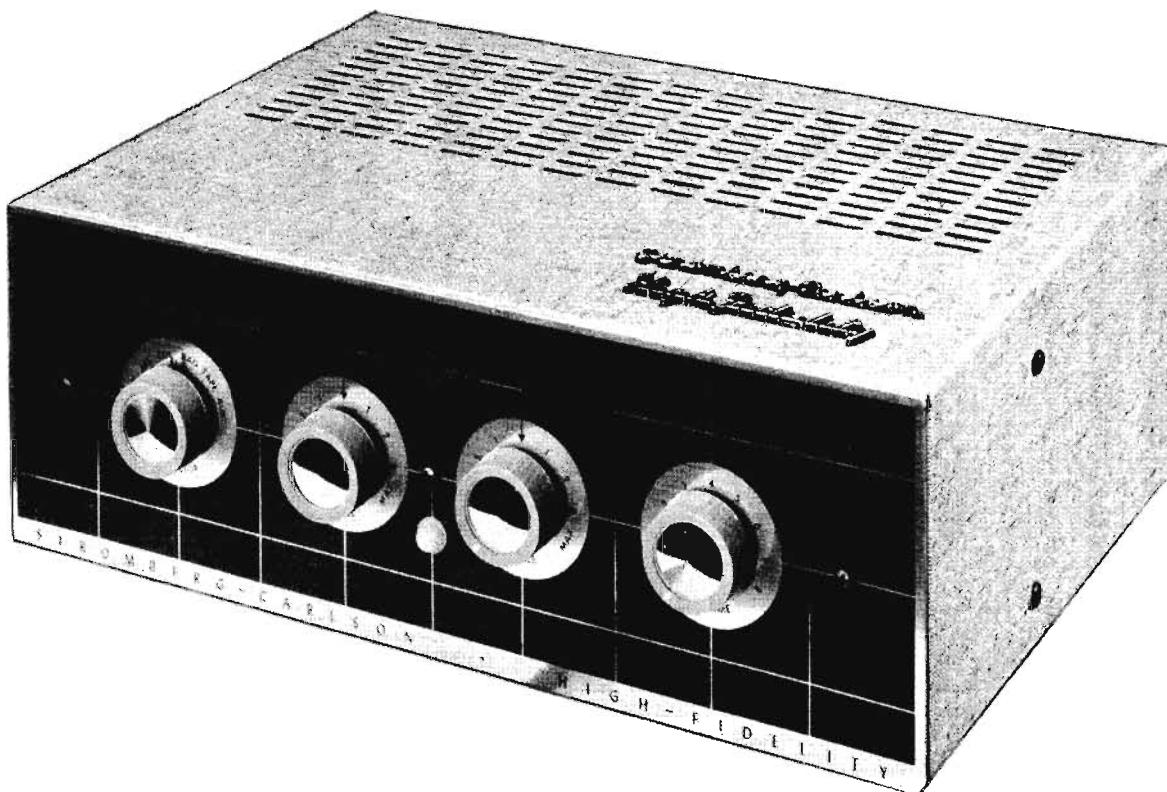


1. DC voltage measurements taken with vacuum tube voltmeter;  
AC voltages measured at 1000 ohms per volt.
2. Output voltages measured at minimum output load.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of +15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

**PHOTOFAC<sup>TM</sup> Folder**



**STROMBERG-CARLSON  
MODEL AR-419**



**STROMBERG-CARLSON  
MODEL AR-419**

TRADE NAME	Stromberg-Carlson Model AR-419		
MANUFACTURER	Stromberg-Carlson Co., Service Dept., 1700 University Ave., Rochester 10, N. Y.		
TYPE SET	AC Operated Audio Amplifier		
TUBES (Six)	Types 6SJ7 AF Amplifier, 12AT7 AF Amplifier, 12AT7 AF Amp.-Phase Inv., (2) 6L6GB Output, 5U4GB Rectifier		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	1.1 Amp. @ 117 Volts AC (110 Watts)

**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 H233

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## PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	6SJ7	
V2	AF Amplifier	12AT7	
V3	AF Amp - Phase Inv.	12AT7	

ITEM No.	USE	TYPE	NOTES
V4	Output	6L6GB	
V5	Output	6L6GB	
V6	Rectifier	5U4GB	

## ELECTROLYTIC CAPACITORS

ITEM No.	CAP.	VOLT.	REPLACEMENT DATA					
			STROMBERG-CARLSON PART NO.	AEROVOX PART NO.	CORNELL-DUBLINER PART NO.	MALLORY PART NO.	PYRAMID PART NO.	SANGAMO PART NO.
C1A	.30	500	48320-000					
B	.30	500		AFH2-72	B0530	FP284	TMD-82	D-275
C2A	.40	450	35590-000					TVL-2937
B	.15	300		AFH4-B5-25	D0850	FP431.3		
C	.30	350					Q-310	TVL-4705.6
D	.50	50					MMT-650	
C3	.50	6		XPP8V50	BBR50-6	TT6X50	TD-50-6	TV4-II00

## FIXED CAPACITORS

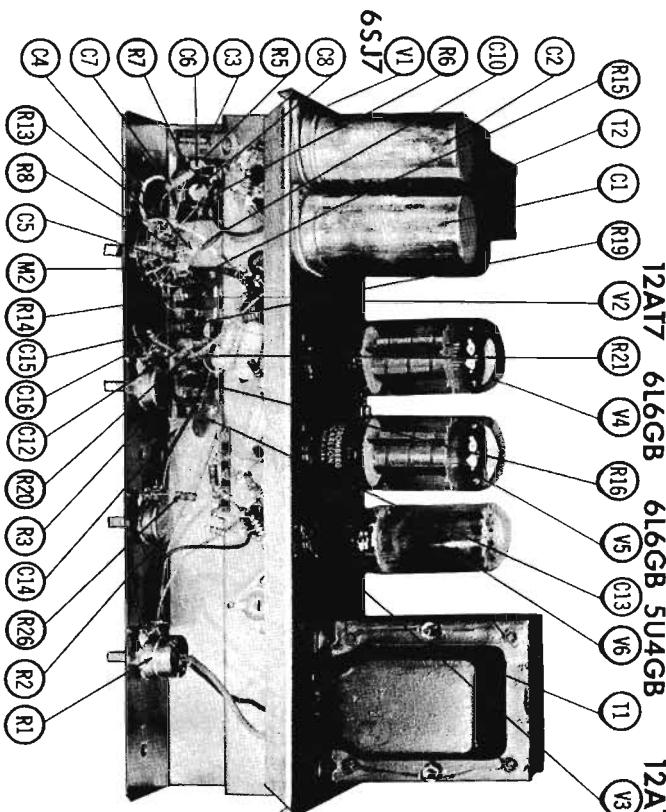
Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	CAP.	VOLT.	REPLACEMENT DATA						NOTES
			STROMBERG-CARLSON PART NO.	AEROVOX PART NO.	CENTRALAB PART NO.	CORNELL-DUBLINER PART NO.	ERIC PART NO.	MALLORY PART NO.	
C4	100		BPD-0001		DD-101	L1071	ED-100	UC-531	5GA-T1
C5	100		BPD-0001		DD-101	L1071	ED-100	UC-531	5GA-T1
C6	100		BPD-0001		DD-101	L1071	ED-100	UC-531	5GA-T1
C7	.47				SI 47	D-470	L76Q47	GP-47	5GA-Q47
C8	.33		BPD-0003		DD-331	L10733	ED-330	UC-533	5GA-T33
C9	.22	400	P488N-22						GEM-4022
C10	.4700		BPD-0047		DD-472	BYAJ0D47	ED-0047	UC-5247	5GA-D47
C11	.033	400	P488N-033		DD-303	CUBJ0B33		GEM-4193	6TM-333
C12	.33				SI 33	D-330	L7633	GP-33	5GA-Q33
C13	.4700		BPD-0047		DD-472	BYAJ0D47	ED-0047	UC-5247	5GA-T47
C14	.470		BPD-00047		DD-471	BYAJ0T47	ED-470	UC-5347	5GA-T47
C15	.470		BPD-00047		DD-472	BYAJ0T47	ED-470	UC-5347	5GA-T47
C16	.4700		BPD-0047		DD-472	BYAJ0D47	ED-0047	UC-5247	5GA-D47
C17	.033	400	P488N-033		DD-303	CUB833		GEM-4193	6TM-333
C18	.470		BPD-00047		DD-471	BYAJ0T47	ED-470	UC-5347	5GA-T47
C19	.1	400	P488N-1		DD-104	CUB4P1		GEM-401	4TM-P1
C20	.1	400	P488N-1		DD-104	CUB4P1		GEM-401	4TM-P1
C21	.1	400	P488N-1		DD-104	CUB4P1		GEM-401	4TM-P1

## CONTROLS

ITEM No.	REPLACEMENT DATA		CENTRALAB PART NO.	CLAROSTAT PART NO.	IRC PART NO.	MALLORY PART NO.	INSTALLATION NOTES	
	RESIST-ANCE	WATTS	STROMBERG-CARLSON PART NO.	NOT Req.	NOT Req.	NOT Req.	Volume	
R1A	500K	1/2	145622-000	B-00-8	A47-500K-2	Q11-133	U46	
B	Shaft			Not Req.	F5-3	Not Req.	Not Req.	
C	Switch	1/2	145681-000	AB-88	SWE-12	T6-1	U8-26	
R2A	5Meg	1/2	145681-000	AB-7	A47-5Meg-2	Q13-141	U85	
B	Switch	1/2	145681-000	AB-88	FS-3	Not Req.	Not Req.	
R3A	1Meg	1/2	145681-000	AK-7	A47-5Meg-2	Q13-141	U85	
B	Shaft	1/2	173653-000		FB-3	Not Req.	Not Req.	
R4	100Ω	2						Hum Adjust (Wire Wound)

## 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
	OHMS	WATT	Stromberg-Carlson PART No.	IRC PART No.	
R5	100K		BTS-100K		
R6	1Meg		BTS-1Meg		
R7	10K		BTS-10K		
R8	8.2Meg		BTS-8.2Meg		
R9	470K		BTS-470K		
R10	1.8Meg		BTS-1.8Meg		
RU1	100K		BYA-100K		
RU2	3300Ω	1	BTS-3300		
RU3	470K		BTS-470K		
RU4	470K		BTS-470K		
RU5	33K		BTS-33K		
R16	1.8Meg		BTS-1.8Meg		
R17	33K		BTS-33K		
R18	100Ω		BTS-100Ω		
R19	47K		BTS-47K		
R20	470K		BTS-470K		

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	Stromberg-Carlson PART No.	IRC PART No.	
R21	470K		BTS-470K		
R22	1M		BTS-1Meg		
R23	1500Ω		BTS-1500		
R24	4700Ω		BTS-4700		
R25	3300Ω		BTS-3300		
R26	100Ω		BTS-100		
X27	1000Ω		BTS-1000		
R28	470K		BTS-470K		
R29	47K		BTS-47K		
R30	47K		BTS-47K		
R31	220K		BTS-220K		
R32	220K		BTS-220K		
R33	200Ω	5	BTS-15K		
R34	15K		BTS-15K		
R35	47K		BTS-47K		
R36	47K		BTS-47K		
R37	5000Ω	7	PW7-5000		

### TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRL	SEC. 1	SEC. 2	Stromberg-Carlson PART No.	Haldorson PART No.	Merit PART No.	Starcon PART No.	Thordarson PART No.	Triod PART No.	
T1	117VAC @ 1.1A	720VCT @ 160A	6VAC @ 3A	8.3VAC @ 2.8A	161795-000	P9314 ①	P-5173 ①	PC8410 ①	24R05U ①	R-14A ①

① Drill new mounting holes.

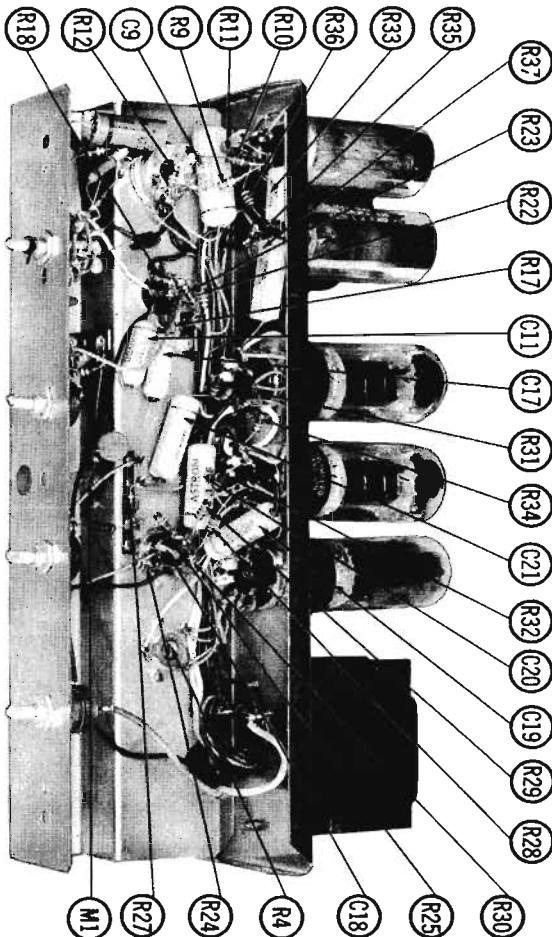
### TRANSFORMER (AUDIO OUTPUT)

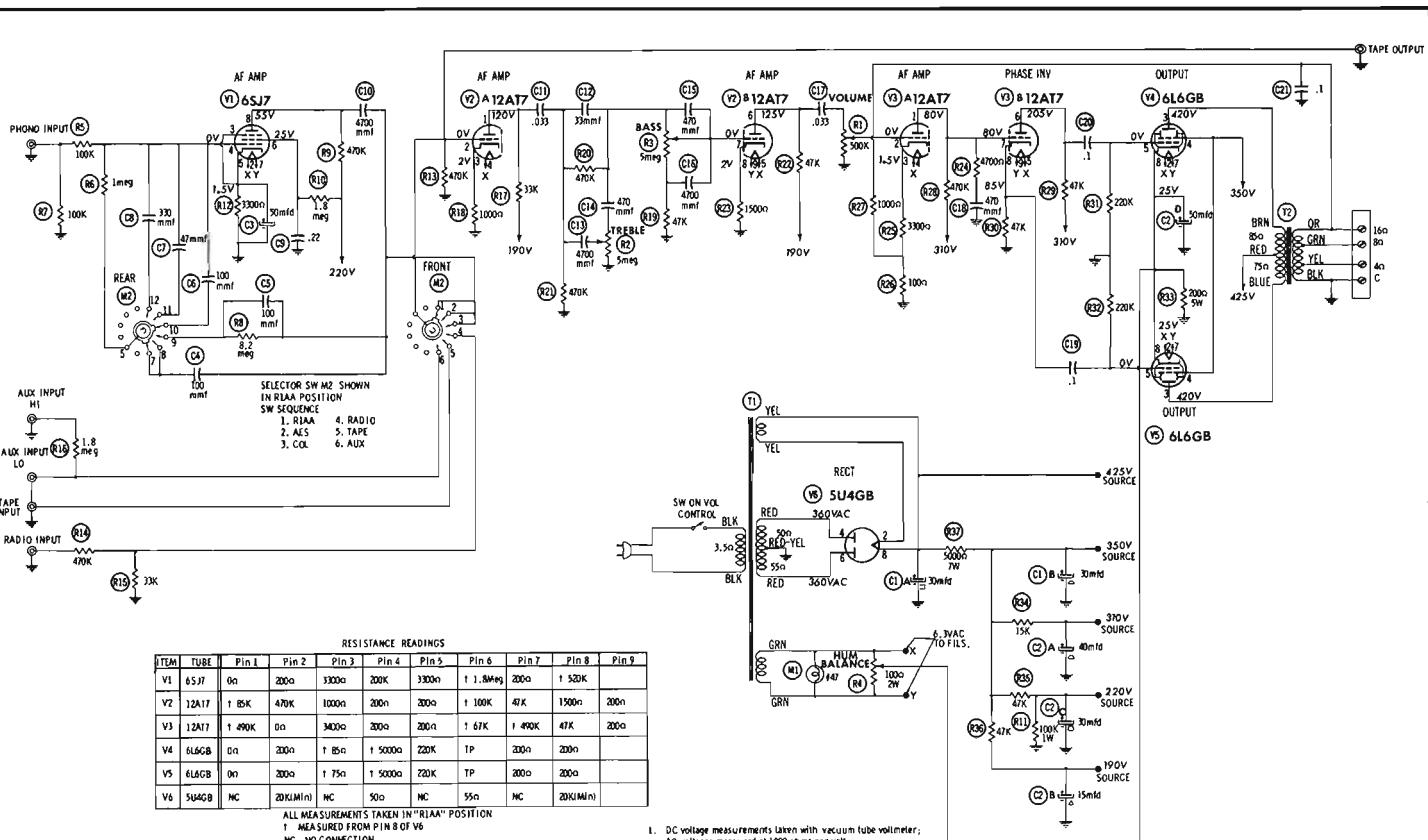
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES	
	PRL	SEC.	Stromberg-Carlson PART No.	Haldorson PART No.	Merit PART No.	Starcon PART No.	Thordarson PART No.	Triod PART No.	
T2	5700Ω CT	1611 Tap @ 6Ω, 4Ω	161355-000	21401	A-3131	A-3307	22597 ①	8-80A	① Drill new mounting holes.

### MISCELLANEOUS

ITEM No.	PART NAME	Stromberg-Carlson PART No.	NOTES
M1	Pilot Lamp Switch	158692-000	#47 Selector (Rotary Wafer Type)
M2			

### CHASSIS—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. Measurements are from ground to chassis or negative.
4. Line voltage minimum at 117 volts, max voltage readings.
5. Nonlinearity tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

2

# SERVICING

# hi-fi

## PREAMPS AND AMPLIFIERS

### SERVICING HI-FI PREAMPS AND AMPLIFIERS

Contains complete information on the circuitry, specifications and replacement parts for 1957-58 Preamps and Amplifiers. Data on the following brand names appears in this volume:

BELL SOUND	HARMON-KARDON
CHALLENGER	KNIGHT
DAVID BOGEN	MADISON FIELDING
ELECTRO-VOICE	NEWCOMB
FISHER	PILOT
GROMMES	SCOTT (H. H.)
HAMILTON	SHERWOOD
	STROMBERG-CARLSON



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