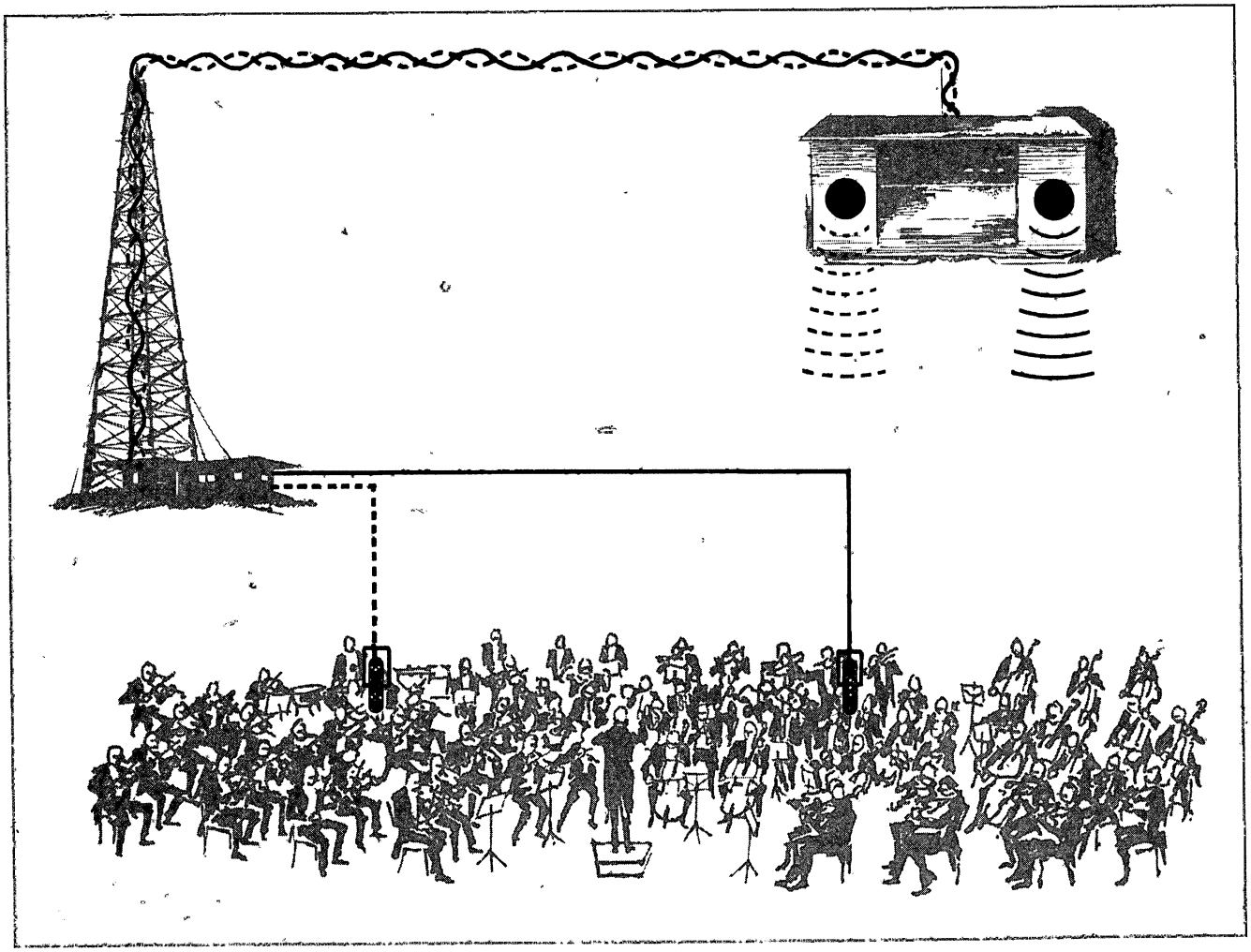
ZENITH®

SERVICE MANUAL



1962 HIGH FIDELITY AND STEREO FM MODELS

ZENITH RADIO CORPORATION

6001 DICKENS AVENUE CHICAGO 39, ILLINOIS

HF-8

PRICE 60 CENTS

INDEX

FEATURES OF SFH & MH HIGH

MODEL NO.	CABINET				CHASSIS			SPEAKER	
	STYLE	MATERIAL	FINISH	COLOR	MODEL	TYPE	EIA POWER OUTPUT	SIZE (IN.)	MAGNET (WT. OZ.)
MHT14C	DROP-IN-TUNER				9H21	AM-FM Tuner	-----	-----	-----
MHT15C	DROP-IN-TUNER				9H20	AM-FM Tuner	-----	-----	-----
GV21	REVERBERATOR KIT FOR FIELD INSTALLATION (INCLUDES REVERBERATOR & CHASSIS)				4G24	-----	-----	-----	-----
HV22	REVERBERATOR KIT FOR FIELD INSTALLATION (INCLUDES REVERBERATOR & CHASSIS)				2H23	-----	-----	-----	-----
SFH2500WT	Console (lift lid)	Wood	Wood	Walnut	3H01	Phono only	4W.	2-3½ 2-6 x 9	.85 3.16
SFH2500RT	Console (lift lid)	Wood	Wood	Mahogany	3H01	Phono only	4W.	2-3½ 2-6 x 9	.85 3.16
SFH2500ET	Console (lift lid)	Wood	Wood	Oak	3H01	Phono only	4W.	2-3½ 2-6 x 9	1.47 3.16
MH2600W	IDENTICAL TO SFH2500WT EXCEPT INCLUDES MHT14C DROP-IN-TUNER								
MH2600R	IDENTICAL TO SFH2500RT EXCEPT INCLUDES MHT14C DROP-IN-TUNER								
MH2600E	IDENTICAL TO SFH2500ET EXCEPT INCLUDES MHT14C DROP-IN-TUNER								
SFH2502RT	Console (lift lid)	Wood	Wood	Mahogany	4G21	Phono only	8.5W.	2-4 2-10	.68 3.16
SFH2502MT	Console (lift lid)	Wood	Wood	Maple	4G21	Phono only	8.5W.	2-4 2-10	.68 3.16
MH2602R	IDENTICAL TO SFH2502RT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2602M	IDENTICAL TO SFH2502MT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
SFH2503WT	Console (lift lid)	Wood	Wood	Walnut	4G21	Phono only	8.5W.	2-4 x 6 2-10	1.47 3.16
SFH2503ET	Console (lift lid)	Wood	Wood	Oak	4G21	Phono only	8.5W.	2-4 x 6 2-10	1.47 3.16
MH2603W	IDENTICAL TO SFH2503WT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2603E	IDENTICAL TO SFH2503ET EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
SFH2504MT	Console (lift lid)	Wood	Wood	Maple	5G29	Phono only	10W.	2-5 2-12	1.47 6.8
SFH2504RT	Console (lift lid)	Wood	Wood	Mahogany	5G29	Phono only	10W.	2-5 2-12	1.47 6.8
MH2604M	IDENTICAL TO SFH2504MT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2604R	IDENTICAL TO SFH2504RT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
SFH2505WT	Console (lift lid)	Wood	Wood	Walnut	5G29	Phono only	10W.	2-4 2-5 2-12	.68 1.47 6.8
SFH2505RT	Console (lift lid)	Wood	Wood	Mahogany	5G29	Phono only	10W.	2-4 2-5 2-12	.68 1.47 6.8
SFH2505ET	Console (lift lid)	Wood	Wood	Oak	5G29	Phono only	10W.	2-4 2-5 2-12	.68 1.47 6.8
MH2605W	IDENTICAL TO SFH2505WT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2605R	IDENTICAL TO SFH2505RT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2605E	IDENTICAL TO SFH2505ET EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2607M	Console (lift lid) (casters)	Wood	Wood	Maple	5G29 MHT15C (9H20)	Phono—AM-FM	10W.	2-3½ 2-5 2-12	.85 1.47 6.8
SFH2515WT	Console (lift lid)	Wood	Wood	Walnut	4H30 7H30	Phono only	40W.	2-3½ 2-5¼ 2-12	.85 3.16 13.0

FIDELITY & STEREO FM MODELS

RECORD CHANGER (SEE NOTES)				CONTROL PANEL	INDICATOR LIGHT	TYPE OF IDENTIFICATION	REVERBERATOR	§RADIAL SOUND SPEAKER
TYPE	MOUNTING	CARTRIDGE	STYLUS					
-----	-----	-----	-----	Die-Cast Escutcheon	No	ZENITH—Crest	-----	-----
-----	-----	-----	-----	Die-Cast Escutcheon	No	ZENITH—Crest	-----	-----
-----	-----	-----	-----	Metal Plate	No	Reverberation	-----	-----
-----	-----	-----	-----	Metal Plate	No	Reverberation	-----	-----
169-151	Shelf	142-111	Sapphire Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	None	None
169-151	Shelf	142-111	Sapphire Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	None	None
169-151	Shelf	142-111	Sapphire Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	None	None
169-148	Shelf	142-118	Sapphire Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	None
169-148	Shelf	142-118	Sapphire Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	None
169-144	Shelf	142-117	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-144	Shelf	142-117	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity	Provisions For GV21	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest	Provisions For GV21	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Extended Stereophonic High Fidelity—Crest Reverberation	Yes	FR101, FR102

FEATURES OF SFH & MH HIGH

MODEL NO.	CABINET				CHASSIS			SPEAKER	
	STYLE	MATERIAL	FINISH	COLOR	MODEL	TYPE	EIA POWER OUTPUT	SIZE (IN.)	MAGNET (WT. OZ.)
SFH2515YT	Console (lift lid)	Wood	Paint	Ebony	4H30 7H30	Phono only	40W.	2-3½ 2-5¼ 2-12	.85 3.16 13.0
SFH2515ET	Console (lift lid)	Wood	Wood	Oak	4H30 7H30	Phono only	40W.	2-3½ 2-5¼ 2-12	.85 3.16 13.0
MH2615W	IDENTICAL TO SFH2515WT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2615Y	IDENTICAL TO SFH2515YT EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2615E	IDENTICAL TO SFH2515ET EXCEPT INCLUDES MHT15C DROP-IN-TUNER								
MH2635R	Console (lift lid) (casters)	Wood	Wood	Mahogany	12H26 3H32	Phono—AM-FM	10W.	2-3½ 2-5 2-12	.85 1.47 6.8
MH2635M	Console (lift lid) (casters)	Wood	Wood	Maple	12H26 3H32	Phono—AM-FM	10W.	2-3½ 2-5 2-12	.85 1.47 6.8
MH2670W	Console (lift lid)	Wood	Wood	Walnut	14H25 7H31	Phono—AM-FM	40W.	2-3½ 2-Horn 2-12	.85 4.28 13.0
MH2670Y	Console (lift lid)	Wood	Paint	Ebony	14H25 7H31	Phono—AM-FM	40W.	2-3½ 2-Horn 2-12	.85 4.28 13.0
MH2670E	Console (lift lid)	Wood	Wood	Oak	14H25 7H31	Phono—AM-FM	40W.	2-3½ 2-Horn 2-12	.85 4.28 13.0
MH2675H	Console (lift lid)	Wood	Wood	Cherry	14H25 7H31	Phono—AM-FM	40W.	2-3½ 2-Horn 2-12	.85 4.28 13.0
MH2685H	Console (lift lid)	Wood	Wood	Cherry	14H25 7H31	Phono—AM-FM	40W.	2-3½ 2-Horn 2-12	.85 4.28 13.0
MH2786W	Console (lift lids)	Wood	Grained	Walnut	16H23 4G21 MHT15C (9H20)	TV-Phono AM-FM	8.5W.	2-3½ 2-10	.85 6.8
MH2786R	Console (lift lids)	Wood	Grained	Mahogany	16H23 4G21 MHT15C (9H20)	TV-Phono AM-FM	8.5W.	2-3½ 2-10	.85 6.8
MH2786E	Console (lift lids)	Wood	Grained	Oak	16H23 4G21 MHT15C (9H20)	TV-Phono AM-FM	8.5W.	2-3½ 2-10	.85 6.8
MH2786M	Console (lift lids)	Wood	Grained	Maple	16H23 4G21 MHT15C (9H20)	TV-Phono AM-FM	8.5W.	2-3½ 2-10	.85 6.8
MH2787W	Console (lift lids)	Wood	Wood	Walnut	16H23 8H30 MHT15C (9H20)	TV-Phono AM-FM	20W.	2-3½ 2-10	.85 6.8
MH2789R	Console (lift lids) (casters)	Wood	Wood	Mahogany	16H23 8H30 MHT15C (9H20)	TV-Phono AM-FM	20W.	2-5¼ 2-12	1.0 6.8
MH2789M	Console (lift lids) (casters)	Wood	Wood	Maple	16H23 8H30 MHT15C (9H20)	TV-Phono AM-FM	20W.	2-5¼ 2-12	1.0 6.8

FIDELITY & STEREO FM MODELS

RECORD CHANGER (SEE NOTES)				CONTROL PANEL	INDICATOR LIGHT	TYPE OF IDENTIFICATION	REVERBERATOR	§ RADIAL SOUND SPEAKER
TYPE	MOUNTING	CARTRIDGE	STYLUS					
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR101, FR102
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR101, FR102
169-150	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-150	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-149	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR105
169-149	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR105
169-149	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR105
169-149	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR105
169-149	Shelf	142-121	Diamond Sapphire	Die-Cast Escutcheon	Yes	ZENITH Extended Stereophonic High Fidelity–Crest Reverberation	Yes	FR105
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For GV21	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For HV22	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For HV22	FR101, FR102
169-145	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity–Crest	Provisions For HV22	FR101, FR102

FEATURES OF SFH & MH HIGH

MODEL NO.	CABINET				CHASSIS			SPEAKER	
	STYLE	MATERIAL	FINISH	COLOR	MODEL	TYPE	EIA POWER OUTPUT	SIZE (IN.)	MAGNET (WT. OZ.)
MH3388W	Console (lift lids)	Wood	Wood	Walnut	16H22Q 8H30 MHT15C (9H20)	TV-Phono AM-FM	20W.	2-5¼ 2-12	1.0 6.8
FR101L	Table	Wood	Leatherette	Brown Mahogany Cowhide	-----	-----	-----	7½	1.47
FR102L	Table	Wood	Leatherette	Manhattan Tan Colony	-----	-----	-----	3½ 6 x 9	.85 3.16
FR105L	Table	Wood	Leather	Antique	-----	-----	-----	Horn 6 x 9	4.28 3.16

FIDELITY & STEREO FM MODELS

RECORD CHANGER (SEE NOTES)				CONTROL PANEL	INDICATOR LIGHT	TYPE OF IDENTIFICATION	REVERBERATOR	§RADIAL SOUND SPEAKER
TYPE	MOUNTING	CARTRIDGE	STYLUS					
169-159	Shelf	142-121	Diamond Sapphire	Metal Plate	No	ZENITH Stereophonic High Fidelity—Crest SPACE COMMAND "400"	Provisions For HV22	FR101, FR102
-----	-----	-----	-----	-----	No	None	-----	-----
-----	-----	-----	-----	-----	No	ZENITH Radial Sound	-----	-----
-----	-----	-----	-----	-----	No	ZENITH Radial Sound	-----	-----

GENERAL

STEREOPHONIC (MULTIPLEX) TRANSMITTER

A new form of FM broadcasting has been approved by the Federal Communications Commission. This will provide stereophonic FM broadcasting and reception adding an exciting new dimension to FM radio listening.

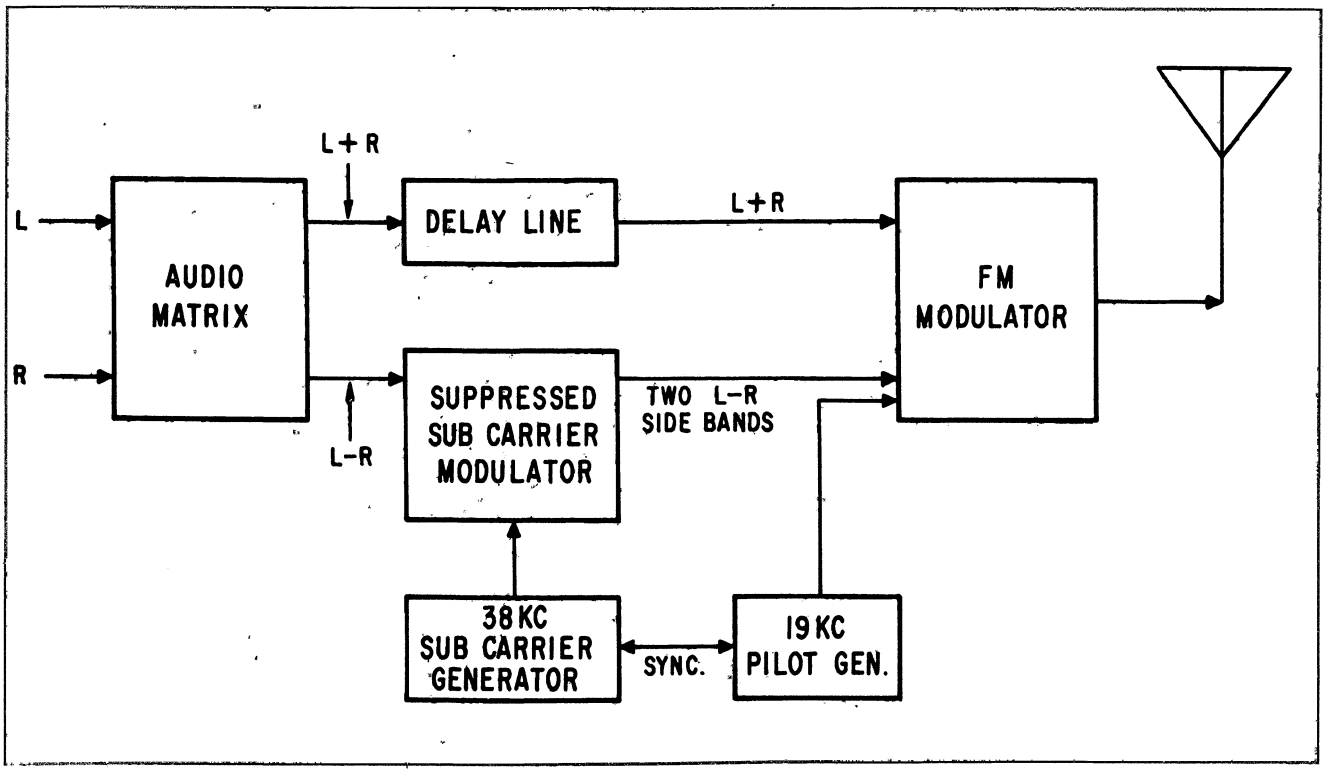
Basically, we are only concerned with the operation of the stereophonic receiver, but perhaps the best way in which we can understand the receiver's operation is to understand the method by which this information is transmitted. As a result, we must review the very basic concepts of a stereophonic FM transmitter.

To develop a stereophonic method of FM transmission, it was not only necessary for the method to be compatible with existing monophonic receivers, but the system also had to be capable of transmitting background music, facsimile, or any other form of SCA service simultaneously with stereophonic programming without any co-interference, and still remain within channel limits licensed to any FM broadcast station.

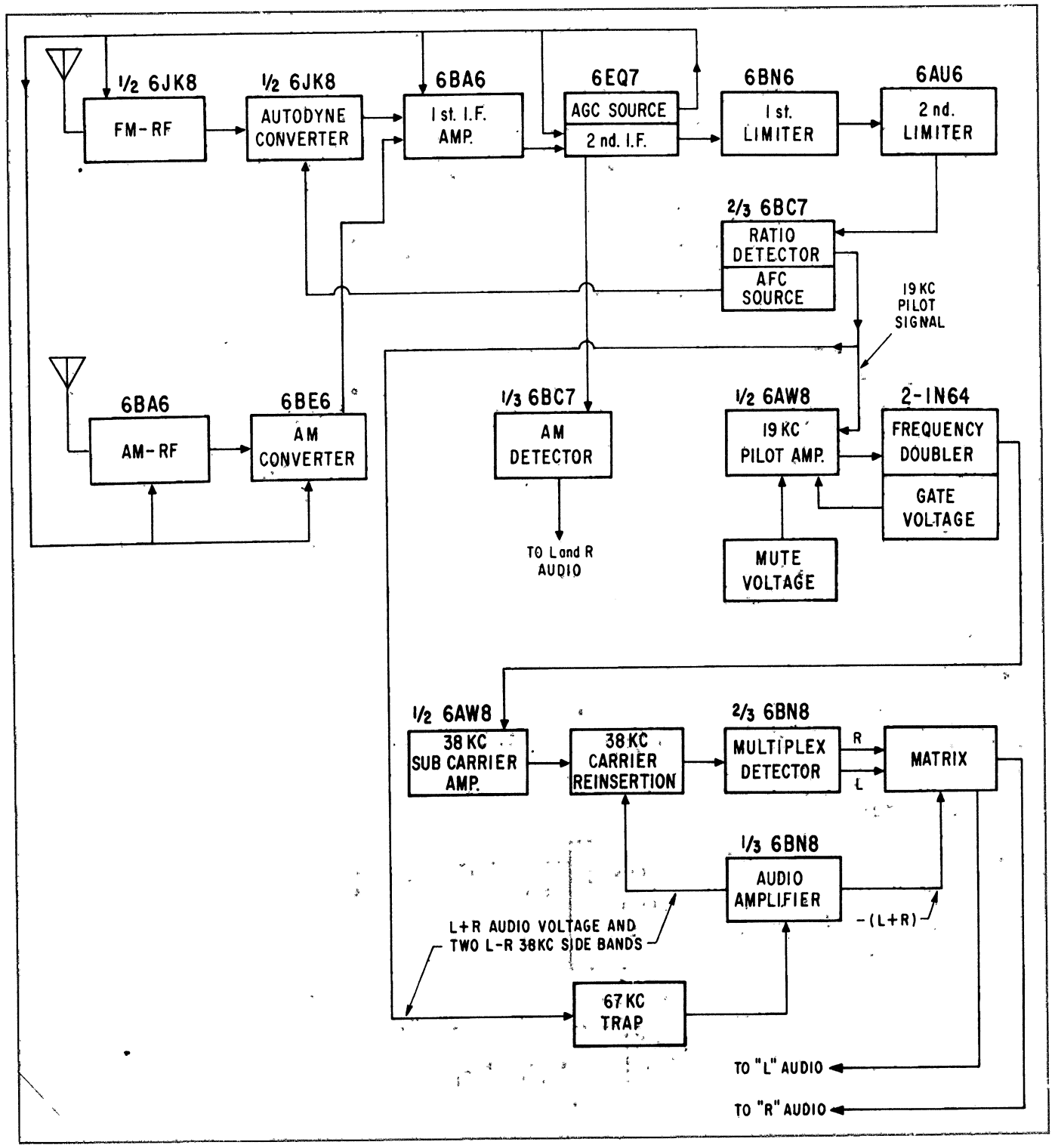
BLOCK DIAGRAM

The two basic components necessary for any stereo system are right and left audio channel information. This information is matrixed and we obtain sum information (L + R), and difference information (L – R). We can now use the composite L + R and L – R information as modulating components. The L + R information must go through a delay system to insure it being in phase with the two L – R side bands at the modulator. We then FM modulate the main carrier with L + R information. This is the information that a conventional FM receiver would detect. We AM modulate the 38 KC sub-carrier with L – R information, suppress its carrier, and then use the two side band components to also FM modulate the main carrier. These two carrier modulating components (L + R audio and the two L – R side bands) are amplitude interleaved. To provide information for re-inserting the stereo subcarrier at the receiver, we also FM modulate the main carrier with a 19 KC pilot signal.

It is important to note that these three modulating elements (L + R audio, two L – R side bands, and the 19 KC pilot signal) are what the stereophonic receiver must recover from the FM signal at the ratio detector. With these three elements recovered, the stereo FM receiver can recreate the original L and R signals required for stereophonic reproduction.



TRANSMITTER BLOCK DIAGRAM



BLOCK DIAGRAM 12H26 MULTIPLEX RECEIVER

MULTIPLEX RECEIVER

The 12H26 chassis is used to describe the circuitry of Zenith FM stereophonic multiplex receivers, since it includes all the features that are basically common to all multiplex chassis in the line.

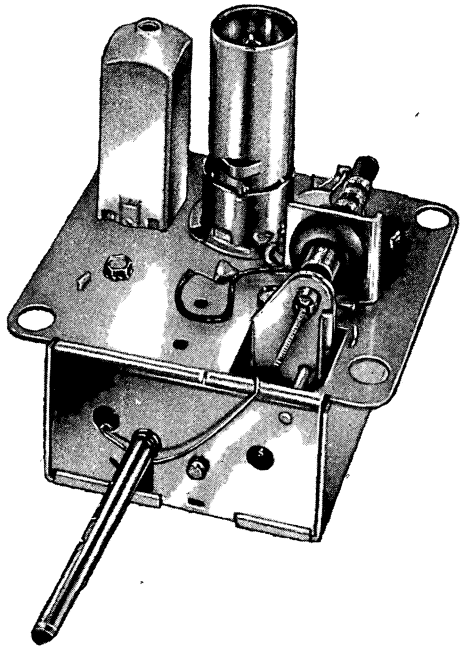
If this material is studied thoroughly, the technician should have sufficient basic information to analyze any of the chassis contained in this manual. It is suggested that the 12H26 Receiver block diagram on page 11 be studied carefully before reading the circuit description.

FM-AM TUNERS

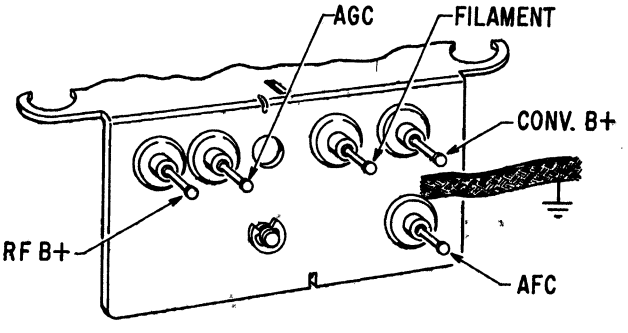
The FM and AM tuners in this chassis are separate units and each is integral and complete. Since stereo tuners require more sensitivity and selectivity than do monaural FM tuners, and since the equipment must function within the Federal Communication Commission's radiation limits, it was felt that these goals could best be achieved by having the FM tuner separate from the AM tuner. In this manner all long leads, band switching and other associated circuitry that contribute to radiation problems and reduce each tuner's performance, can be eliminated. The AM tuner uses a 6BA6 tuned RF amplifier and a 6BE6 pentagrid converter. It utilizes a tuned 3-gang circuit with AGC on both the RF and pentagrid converter tubes.

FM-RF AMPLIFIER

This tuned FM-RF stage has an input impedance of 300 ohms. The RF amplifier uses neutralized triode circuitry of a 6JK8 dual triode tube. This tube was developed specifically for such an application, and provides a mutual conductance of 15,000 micromhos. This RF stage in conjunction with the other circuits gives this receiver a sensitivity of approximately 2 microvolts for 30 db quieting on FM.



FM TUNER



FM TUNER TERMINAL BOARD

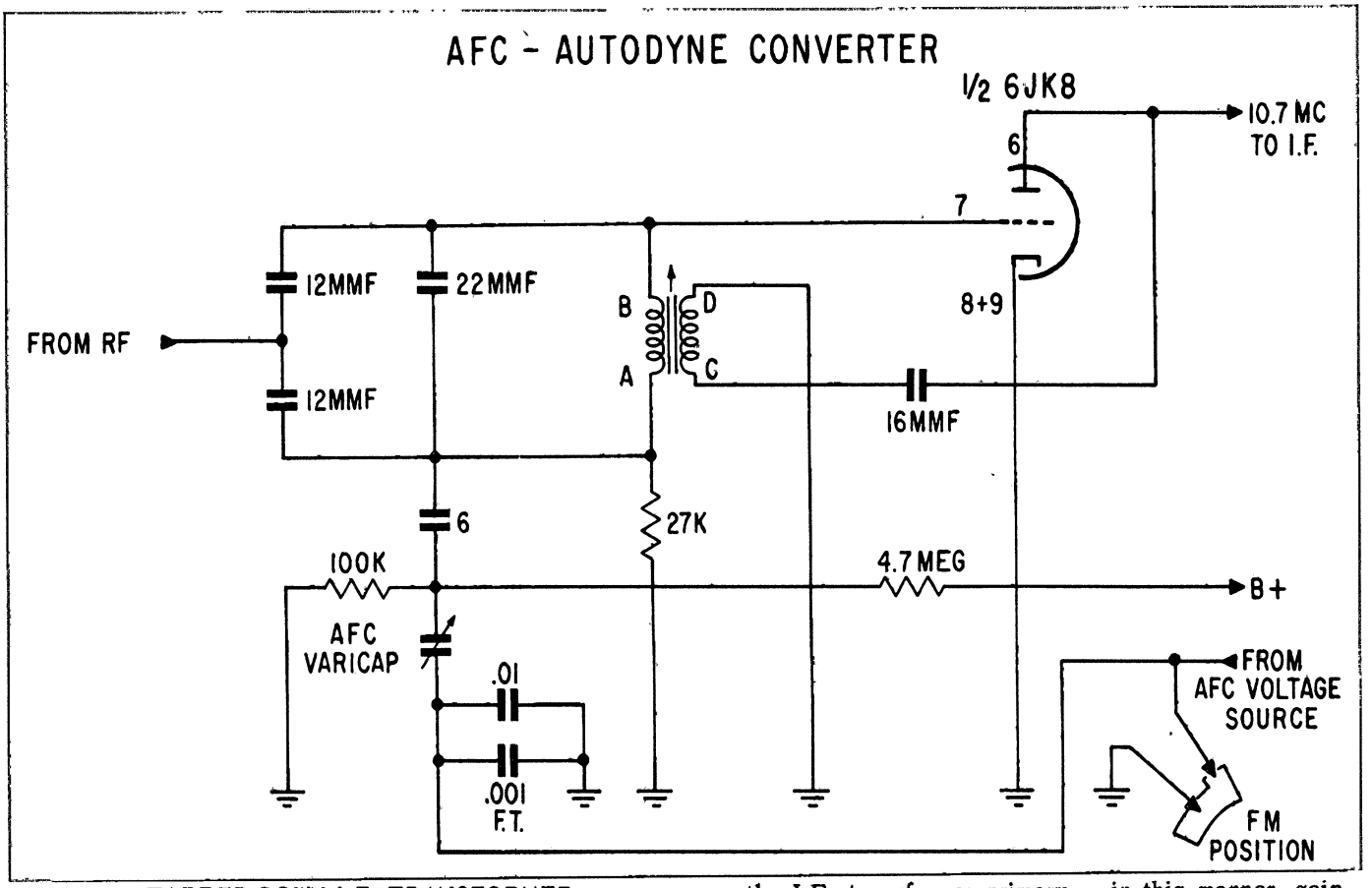
FM CONVERTER AND AUTOMATIC FREQUENCY CONTROL

The autodyne converter consists of a triode oscillator with an RF signal coupled into the grid circuit at the junction of the two 12 mmf. capacitors. This RF signal mixes with the oscillator to produce a 10.7 megacycle IF frequency, which is coupled out of the converter plate circuit by the primary of the 1st FM IF transformer.

As with all high frequency oscillators, stability is important and as a feature, it is desirable to provide automatic frequency control, which is guided by voltages directly related to oscillator frequency shift. This is accomplished by taking D.C. voltage from the ratio detector and feeding it back to a Varicap, (CV) which is a voltage controlled variable capacitor. This Varicap is connected in the oscillator grid circuit and acts as a frequency controlling device. If the oscillator shifts frequency, this causes ratio detector unbalance and a D.C. voltage is fed back to the Varicap, so its changing capacity will automatically adjust the frequency of the oscillator circuit to compensate for original oscillator shift. In this manner, we have continuous automatic oscillator frequency control which eliminates drift and simplifies F.M. tuning.

There is a possibility that some component may fail in the oscillator circuit that will shift the frequency beyond the 1 megacycle control range of the Varicap. This would then require analysis and replacement of the component.

Should you desire to receive a weak FM station within the AFC pull-in range of a strong FM station (1 MC) an AFC disabling switch has been provided in the receiver circuitry. The AFC source voltage is removed from the oscillator circuit by grounding. When switching from FM-AFC to FM, the bottom of the oscillator coil is returned to cathode through ground and the oscillator circuit functions without automatic frequency control.

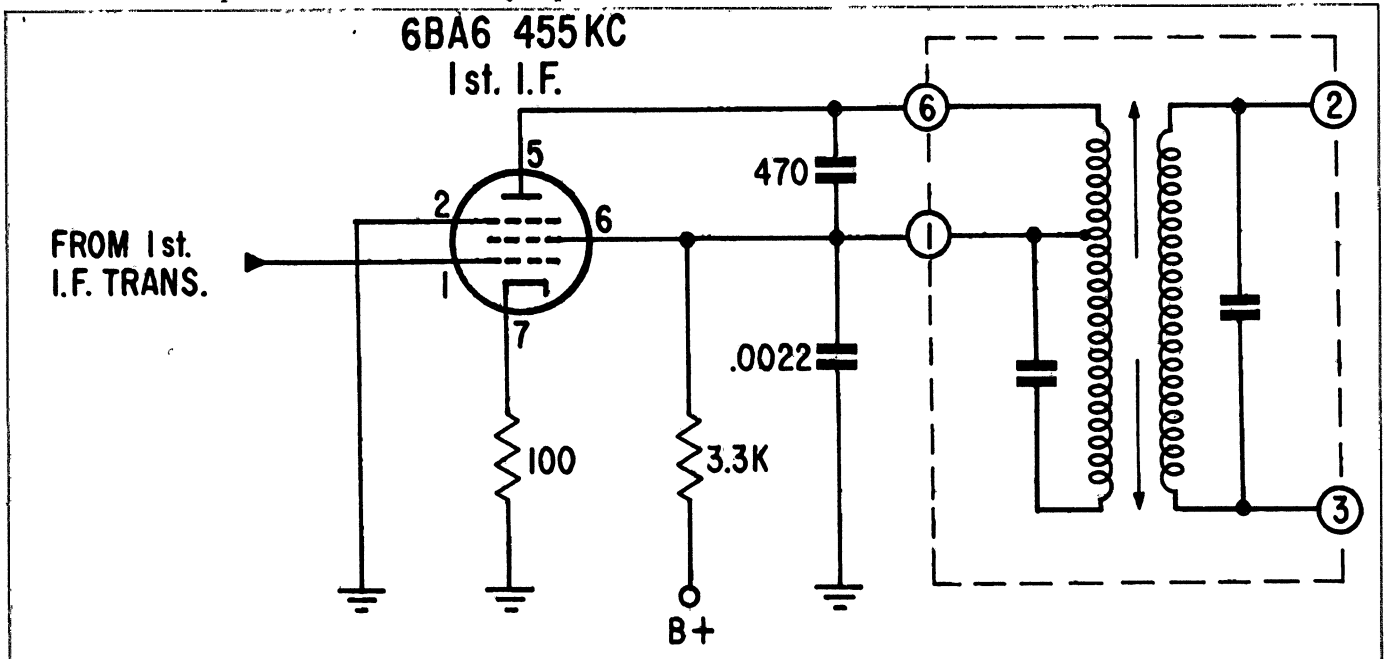


TAPPED DOWN I.F. TRANSFORMER

In this receiver more than sufficient 455 KC IF gain is available and it may be desirable to reduce it to eliminate overload problems. Normally, the simple way to reduce the gain of an I.F. transformer is to shunt or swamp its primary by paralleling a resistor across it. However, in doing so, the Q of the coil is also reduced and, as a result, selectivity is impaired. Since it is desired to maintain selectivity and at the same time reduce gain, the output of the plate circuit of the I.F. amplifier tube is fed to only a portion of the I.F. transformer primary...in this manner, gain is reduced. However, at the same time, the Q of the coil and selectivity are retained.

IF AMPLIFIERS

The 6BA6 1st and 6EQ7 2nd IF amplifiers are conventional. The 6EQ7 envelope incorporates a diode which is the AGC voltage source. Since both 10.7 MC and 455 KC signals pass through this tube, it provides an excellent source from which to obtain an automatic gain control voltage for both AM and FM.



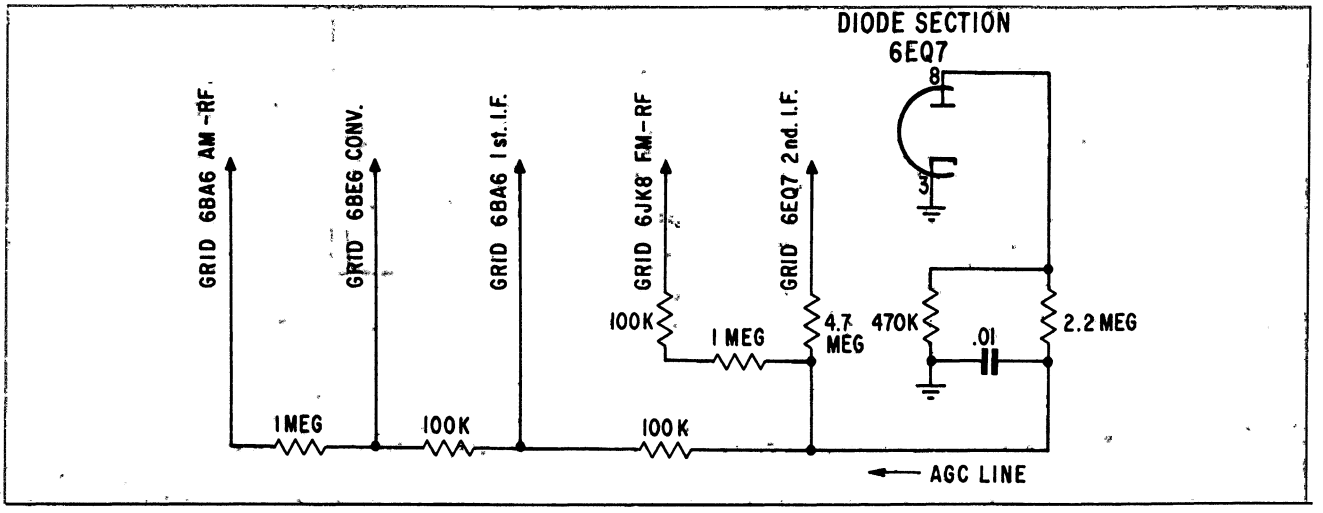
SCHEMATIC TAPPED DOWN I.F. TRANSFORMER

AGC SOURCE AND NETWORK

A.G.C. voltage developed from the 6EQ7 diode plate controls the preceding circuits in the following sequence.

1. 6EQ7 second IF amplifier grid. (½ developed AGC voltage.)
2. 6JK8 FM-RF amplifier grid.
3. 6BA6 first IF amplifier grid.
4. 6BE6 AM converter grid.
5. 6BA6 AM-RF amplifier.

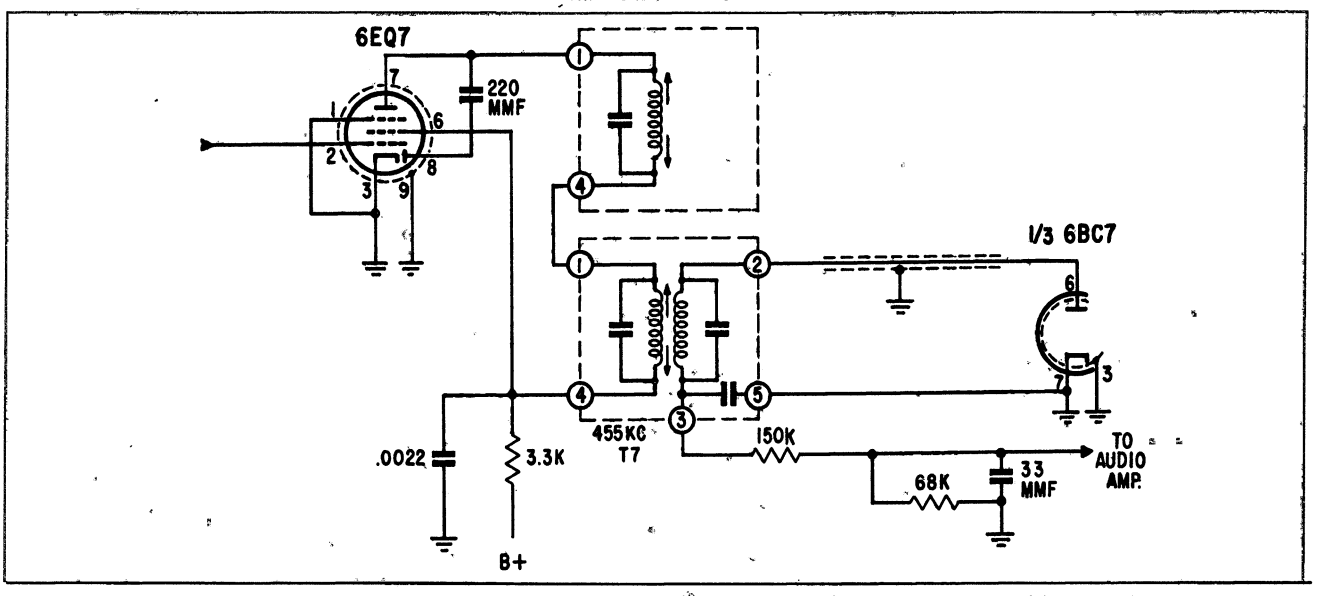
AGC SOURCE AND NETWORK



AM DETECTOR

During AM operation, the secondary of the third 455 KC I.F. transformer (T7) is connected to one of the 6BC7 diodes. Before rectification, the familiar AM modulated envelope is present and since both the positive and negative halves of this envelope contain symmetrically identical information, it will not be necessary to full wave rectify but half wave rectification will suffice. This type detection is standard in AM type receivers. The audio voltage from the AM detector is then fed through the bandswitch to the audio portion of the receiver.

AM DETECTOR



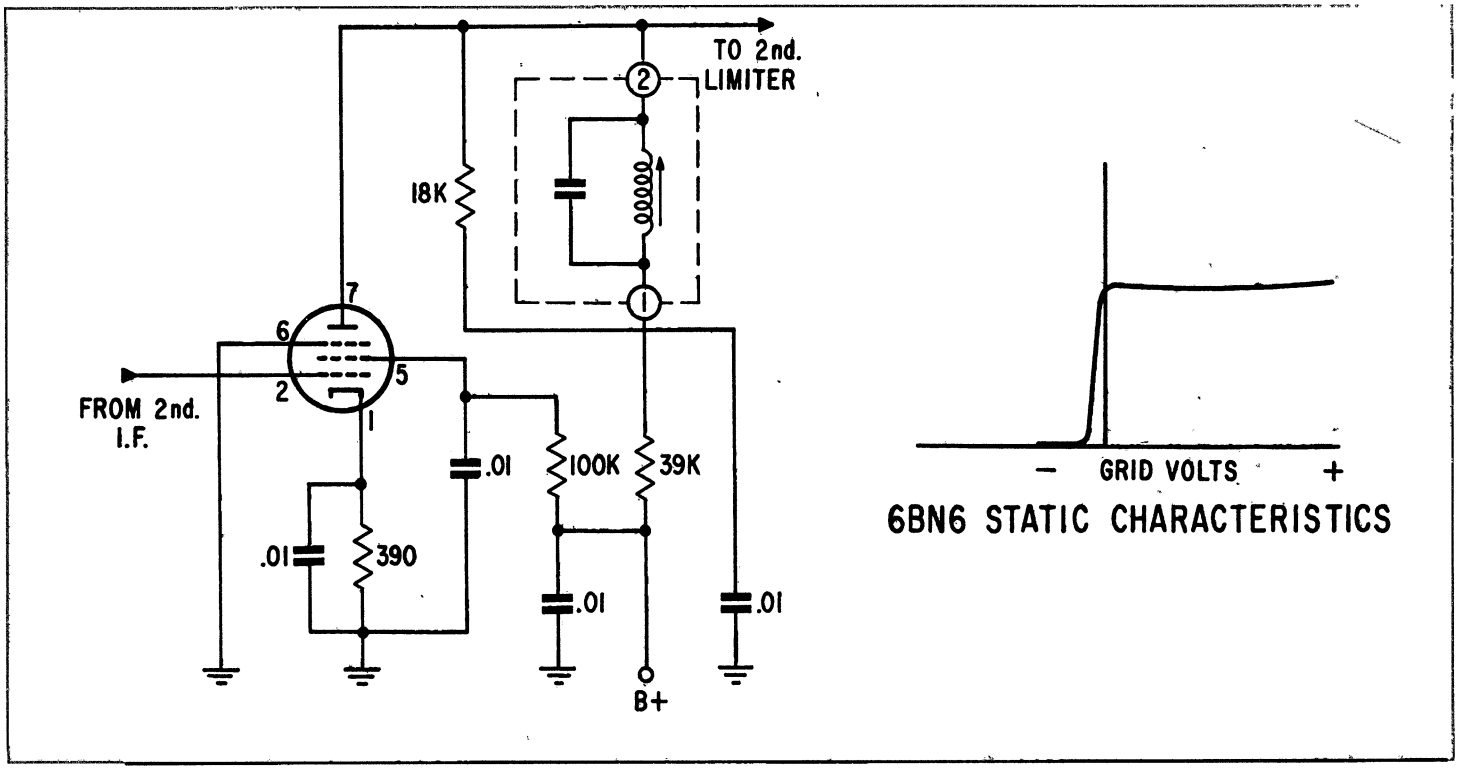
1ST LIMITER

The 6BN6 is used as a zero time constant limiter and was chosen since it is a gated beam type tube whose plate current changes from zero to saturation with a change of approximately 2 volts in grid potential.

This complete transition from zero to full plate current with a very small change in grid voltage is quite applicable to a system in which it is desired that rapid limiting occur so that noise with a very short time constant (pulses) can be clipped from the desired signal. In the accompanying sketch, the circuit appears to be quite comparable to a linear amplifier, however, its limiting qualities are due to the steep plate current characteristics.

As a result of this characteristic, limiting occurs instantaneously without the use of energy storage as in normal limiters, and nothing is carried over from one cycle to the next. The second control grid, Pin 6, would normally be connected to the plate for greatest amplification, however, in this application we have sufficient gain and as a result gain can be sacrificed, therefore, we have returned this grid to ground. In this manner, limiting occurs with the smallest possible input signal.

6BN6 1st. LIMITER



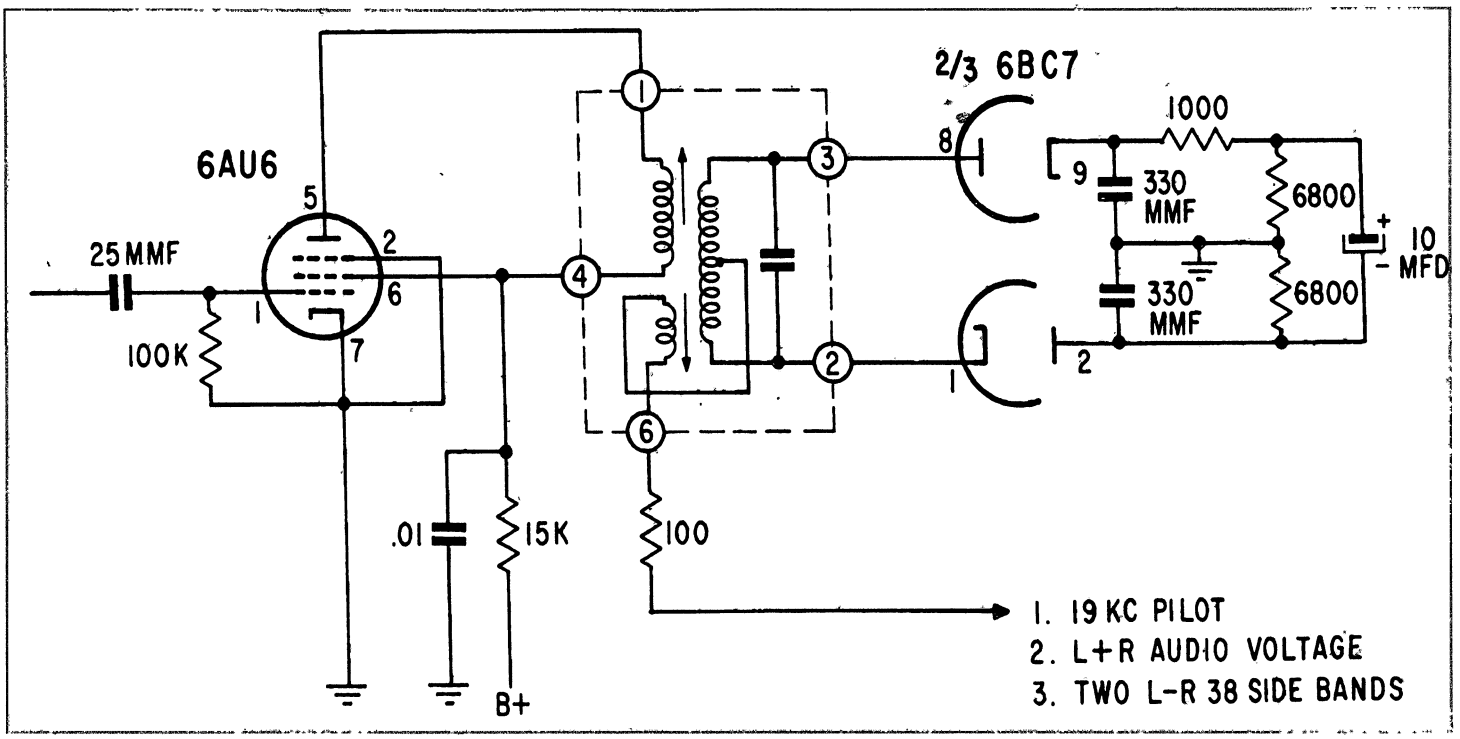
RATIO DETECTOR

The ratio detector circuit may be considered standard; it utilizes two diodes of the 6BC7 triple diode. The composite output from this ratio detector consists of the following information when stereo FM is received.

1. A 19 KC pilot signal.
2. L + R audio voltage.
3. Two L - R 38 KC side bands.

This information is separated, and the 19 KC pilot signal is fed to the 19 KC pilot amplifier. The L + R audio voltage and the two L - R 38 KC side bands both go to the 67 KC trap.

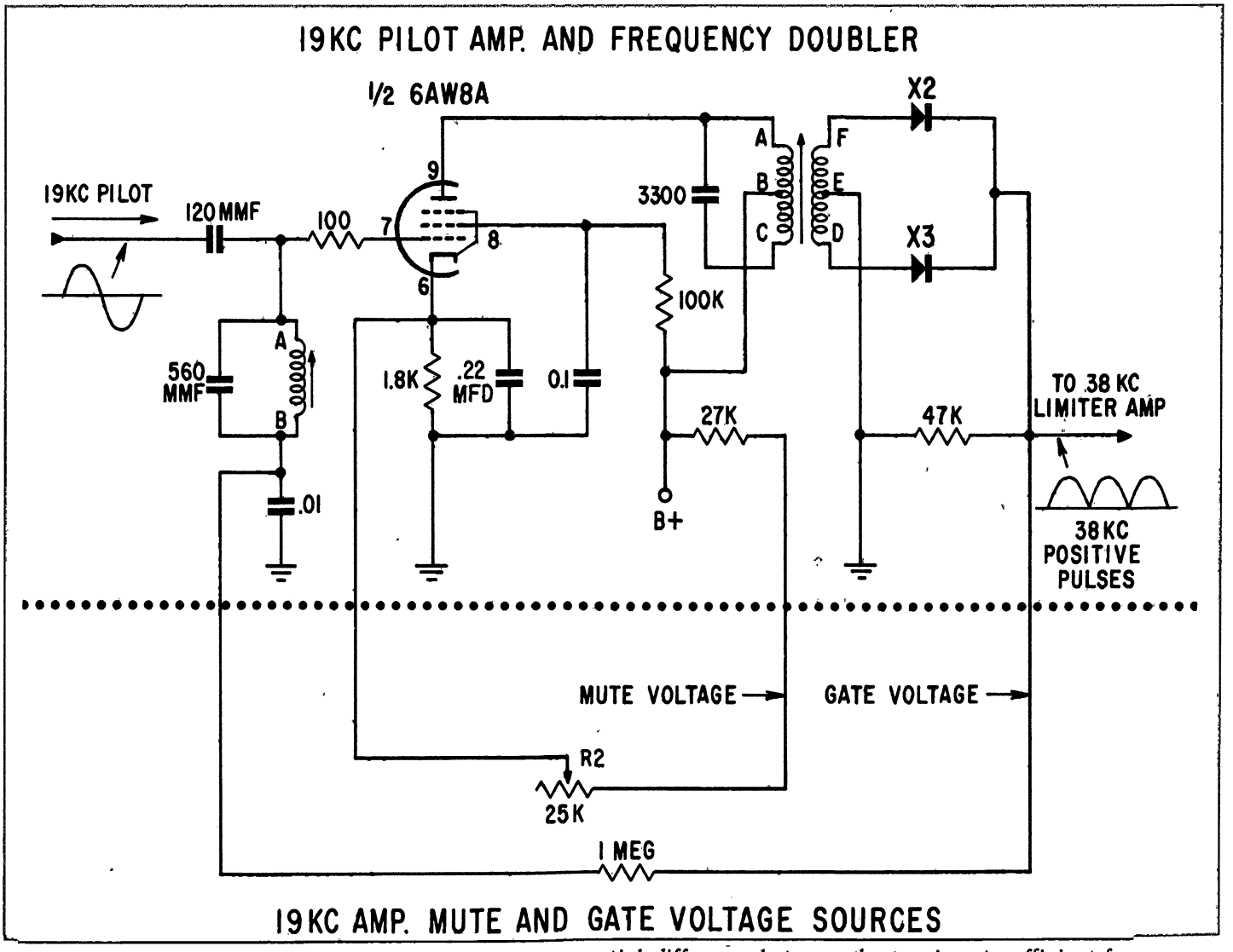
RATIO DETECTOR



19 KC PILOT AMPLIFIER MUTE-GATE VOLTAGE SOURCES and DOUBLER

The 19 KC pilot signal from the output of the ratio detector is fed to a 19 KC tuned grid-tuned plate amplifier for amplification, and to eliminate other undesired signals. To insure its operation only on signals of sufficient amplitude for practical stereophonic reception, this tube is muted. The mute voltage is obtained from the B + line through a 25 K pot (R2), and this voltage is impressed on the cathode of the 6AW8A pentode section. When the incoming 19 KC signal is sufficient to overcome this back bias, it then causes the 6AW8A to conduct and amplify. In the plate circuit of this amplifier, a center tapped 19 KC tuned circuit is used and a pair of 103-34 diodes (X2 and X3) operating as a full wave unfiltered rectifier, act as a frequency doubler. The output of this full-wave rectifier is a series of 38 KC positive pulses. Use is made of this 38 KC pulsating DC voltage to perform two functions.

As a gate voltage, it is now fed back to the grid of the 6AW8A pentode pilot amplifier, and raises the grid to a potential that is within 2 volts of the mute voltage previously impressed on the cathode... this changes the tube's operating characteristic, resulting in greater amplification. As a result, the 6AW8A is normally muted during monaural operation and only becomes operative with an adequate 19 KC signal. The second application of the 38 KC pulses will be discussed under "38 KC Subcarrier Amplifier".

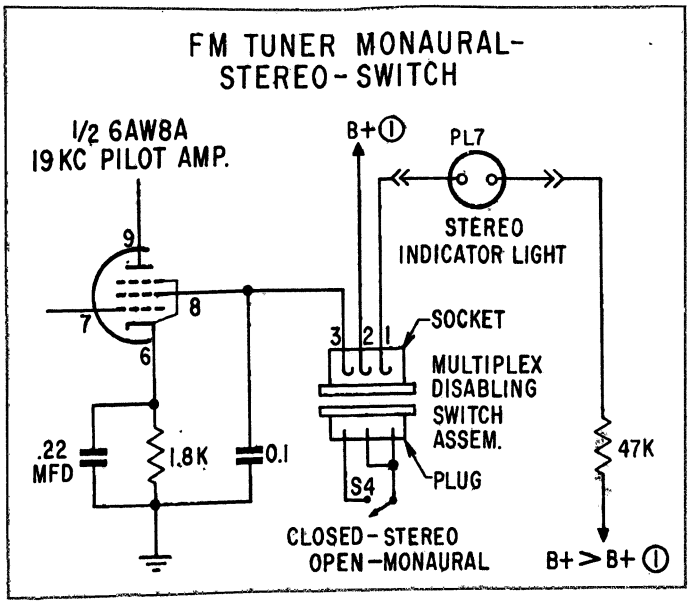


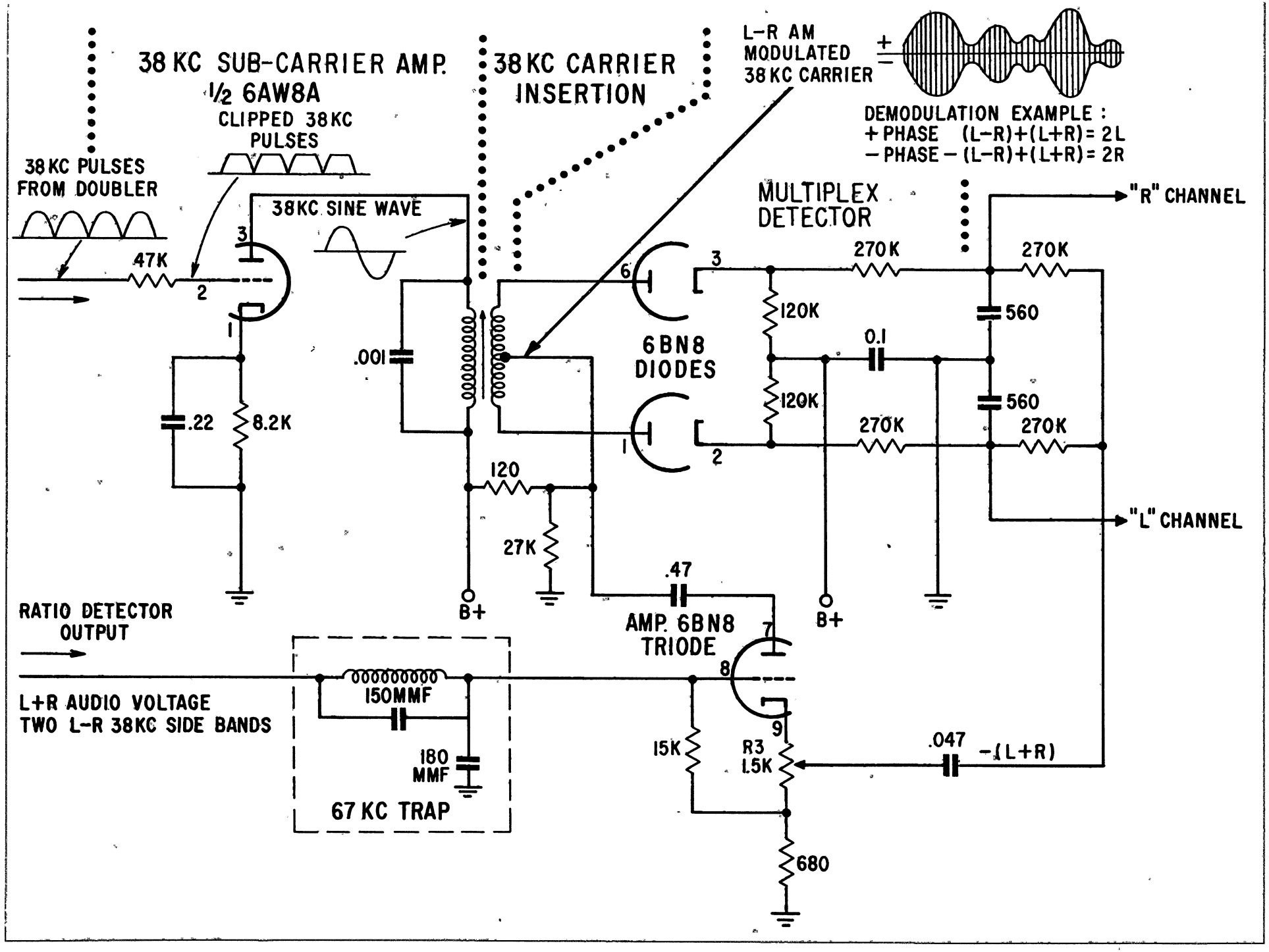
STEREO MONAURAL INDICATOR

The stereo/monaural indicator consists of a neon bulb (PL-7) which lights when the receiver is properly tuned to an incoming stereo signal, and operating in the stereo mode. One side of the neon is connected to a B + line of approximately 235 volts and the other side of it is connected to the 6AW8A pentode screen. During monaural operation, without a 19 KC pilot signal, the 6AW8A will not be drawing screen current, therefore, the voltage on its screen will be high and of a magnitude relative to the voltage impressed at the other side of the neon indicator so the potential difference between the two is not sufficient for ignition of the neon bulb. When a 19 KC pilot signal arrives that is of sufficient magnitude to overcome the back bias mute voltage, then current flows in the 6AW8A dropping the screen voltage to approximately 100 volts. This now creates a potential difference across the neon indicator of approximately 135 volts. This potential difference is sufficient for ignition, conduction occurs, and the neon bulb lights. When conduction occurs, self-regulation takes place, the 6AW8A screen voltage rises to approximately 138 volts, and the B + voltage on the other side of the neon indicator stabilizes at approximately 210 volts.

FM TUNER MONAURAL-STEREO SWITCH

In some locations, the available signal may vary and as a result, even though initially there was sufficient incoming signal to overcome the back bias on the 6AW8A 19 KC amplifier, with reduced signal there is a possibility that reception will be quite noisy and perhaps even distorted. To provide a method by which we can switch the receiver from the stereo to the monaural mode under these conditions, design has provided a FM tuner Monaural-Stereo switch mounted on the cabinet back. To accommodate this switch assembly, a three-hole socket has been provided into which the assembly is inserted. When the switch is in monaural position, the B+ to the screen of the 6AW8A pentode pin #8 is cut off, and as a result, no 38 KC carrier is created for reinsertion. Without the 38 KC carrier and with the 6AW8A no longer drawing current, voltage changes will occur in the multiplex detector to shift the receiver to the monaural mode of operation. Also, when the screen load is removed from the B+ line, the voltage rises. As a result, we do not have sufficient voltage difference across the neon bulb and it will no longer function, indicating to the customer that the receiver is now operating monaurally.




38 KC SUB-CARRIER AMP.
1/2 6AW8A
CLIPPED 38KC PULSES
38KC PULSES FROM DOUBLER
38KC SINE WAVE
38 KC CARRIER INSERTION
L-R AM MODULATED 38 KC CARRIER
DEMODULATION EXAMPLE :
+ PHASE (L-R)+(L+R)= 2L
- PHASE - (L-R)+(L+R)= 2R
MULTIPLEX DETECTOR
"R" CHANNEL
"L" CHANNEL
47K
.001
.22
8.2K
6BN8 DIODES
270K
120K
0.1
560
120
27K
.47
B+
RATIO DETECTOR OUTPUT
AMP. 6BN8 TRIODE
L+R AUDIO VOLTAGE
TWO L-R 38KC SIDE BANDS
150MMF
180 MMF
67 KC TRAP
15K
R3 1.5K
.047
-(L+R)
680

38 KC SUB CARRIER AMPLIFIER

The 38 KC DC pulses from the doubler are used to create the 38 KC carrier for insertion with the two L – R 38 KC side bands. These pulses are fed to the grid of the 6AW8A triode through a 47,000 resistor where clipping occurs. The plate circuit of the 38 KC limiter amplifier is tuned to 38 KC and when pulses are injected into a resonant circuit so that pulses and the tuned circuit are of the same frequency, ringing occurs in the tuned circuit...in this manner, a sine wave is created. Looking at the plate of the 6AW8A triode with a scope you would see the 38 KC sine wave. This 38 KC sine wave (carrier) is now ready for reinsertion with the two L – R 38 KC side bands that were obtained from the output of the ratio detector.

67 KC TRAP.

Returning to the output of the ratio detector, the remaining two pieces of information obtained here were the L + R audio voltage and the two L – R 38 KC side bands. There is always the possibility that the FM station to which the receiver is tuned is also broadcasting SCA material, which must not be allowed to enter the multiplex detector, or distortion will result. Therefore, the L + R audio voltage and the two 38 KC side bands are fed to a 67 KC broad band trap (59 KC to 75 KC) which is tuned to eliminate any possibility of SCA information from being passed on through to the multiplex detector where it may cause "crosstalk".

38 KC CARRIER INSERTION

Since the L + R and the two L – R 38 KC side band voltages are of low magnitude, it is necessary to amplify both these signals. Therefore, they are fed to the grid of the 6BN8 triode amplifier where their level is raised. The output from the plate of the 6BN8 is coupled through a .47 mfd. capacitor to the center tap of the 38 KC carrier reinsertion transformer. At the primary of this transformer, a 38 KC sine wave is present, and by transformer action, this also appears at the secondary. As a result the two L – R 38 KC side bands will now have their 38 KC carrier reinserted, resulting in the familiar amplitude modulated envelope appearing at the diode plates of the 6BN8.

After drawing the base line through the AM modulation envelope, you will see that we have both positive and negative phases of this L – R modulation envelope with both information halves symmetrically identical. During the positive half cycle, the bottom diode will demodulate the positive half of L – R envelope and we will obtain a L – R audio voltage. Since we are also feeding an L + R audio voltage to the center point of this transformer, we can now add:

$$(L - R) + (L + R) =$$
$$L - R + L + R =$$
$$L - \cancel{R} + L + \cancel{R} = 2L$$

On the negative half cycle, which is 180 degrees out of phase with the positive cycle, the diode will detect the (L – R) negative half of the envelope, and will obtain an audio voltage – (L – R). Since we are again feeding an L + R audio voltage to the center point of this transformer, we now add:

$$-(L - R) + (L + R) =$$
$$-L + R + L + R =$$
$$-\cancel{L} + R + \cancel{L} + R = 2R$$

In this manner, on both the positive and negative phases, we have added the signals and obtained separate L and R information which can now be fed to their respective audio channels.

SEPARATION CONTROL

In the previous explanation of the multiplex detector, it was necessary to assume that the values of L + R and L – R were of equal magnitude, however, this assumption is not quite exact since there can be a difference in the magnitude of these signals. As a result, after demodulation, there is sometimes a small component of R information in the L channel and some small component of L information in the R channel, however, as long as the circuit can maintain a difference of approximately 30 db in the respective magnitudes of these two signals, excellent stereo reproduction will be achieved. Therefore, the circuit includes a factory adjusted separation control (R3) which does not require any additional adjustments. The adjustment is made in the following manner: The transmitter will send out an R signal only, or an L signal only. Assuming that it sends out only an R signal, connect a meter at the output of the L audio channel, and adjust the separation control for minimum R voltage in the L channel. The exact converse adjustment can be made if an L signal were sent. Place an output meter on the R channel, and adjust the separation control for minimum L signal in the R channel.

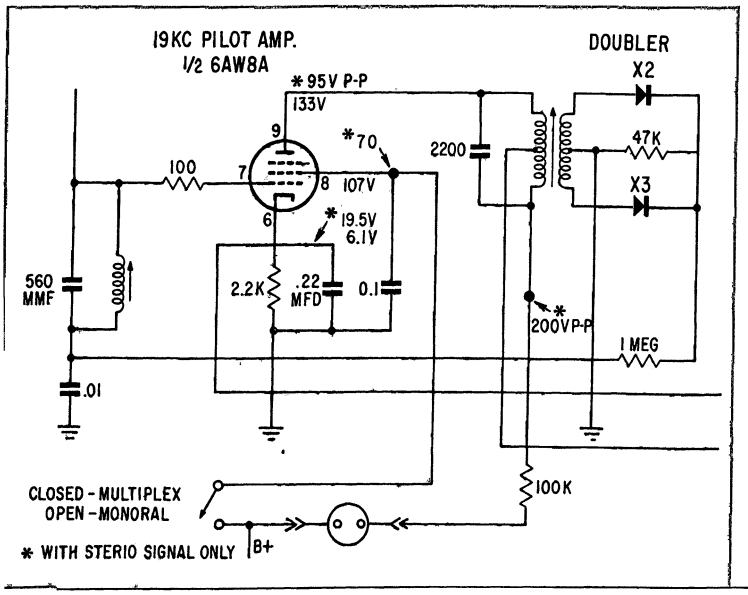
MONAURAL OPERATION

During monaural operation the 6AW8A is not drawing current, and as a result, a change in the B+ voltages takes place so the center tap of the transformer to which the two 6BN8 diode plates are connected becomes positive with respect to the center tapped junction of the two cathodes of the 6BN8 diodes. As a result, the L + R monaural voltage at the plates of the 6BN8 diodes will pass on through the diodes, and we will have L + R (monaural) audio information at both the left and right channel outputs.

STEREOPHONIC INDICATOR CIRCUIT MHT14 CHASSIS 9H21 MHT15 CHASSIS 9H20

Basically, the purpose of the stereophonic indicator on Chassis 9H20-9H21 is the same as on the 12H26 stereophonic tuner; however, it functions in a different manner.

During normal monaural operation, the voltages on the 6AW8A plate (Pin 9) and screen (Pin 8) are 133 and 107 volts respectively, as indicated. The neon stereo indicator is connected between the bottom of the primary of the frequency doubler coil and the 6AW8A screen (B+). Under these monaural conditions, the potential difference across the neon indicator is only 26 volts and not sufficient for ignition.



During stereo operation when a 19 KC signal arrives in sufficient strength to overcome the back bias on the 6AW8A, the tube will begin to conduct and as a result of its drawing current, the screen voltage will drop to approximately *70 volts. With a 19 KC signal now passing through the plate circuit, there will be *95 volts P-P at the plate and approximately *200 volts P-P will be developed across the primary of the frequency doubler coil. With one side of the neon indicator connected to the *200 volt P-P voltage and the other side connected to *70 volts, the potential difference necessary for neon indicator ignition has now been fulfilled... we have approximately *130 volts across this neon indicator. Consequently, the bulb will light up indicating the tuner is operating in the stereo mode.

MH910 CHASSIS 9H22

The Stereo FM Multiplexer was designed to help those who have monaural FM receivers obtain the new stereophonic programs. Adapters could be connected to the old monaural instruments, however, the end effect would usually not be too good, and the multitude of wiring changes necessary as a result of the many, many different FM models, would cause the project to be most impractical. As a result, the MH910 has been developed which can be used in conjunction with any monaural FM receiver, with resulting good stereo reproduction.

The basic principle of operation is as follows. The monaural receiver produces an L + R or sum signal and the multiplexer, if placed on the right, produces only an R signal. To explain the method by which these stereo effects are created, we must examine the output of these receivers. At a time when R information is being produced by both receivers, and assuming that the audio output of the two receivers has been set equally, then R from the left receiver and R from the right receiver produce a new R sound source at a point half-way between the two instruments. Then, using this new R sound source in conjunction with the L information coming from the monaural receiver, we have a complete stereo signal, but spread over only half the distance between the two receivers. In order to get a normal spread of stereo sound, one can either move the receivers farther apart or can adjust the loudness level of each instrument to suit their individual preference.

The advantages of using MH910 in conjunction with a monaural-type FM receiver, are as follows:

1. The old FM receiver is not obsolete.
2. Connecting wires are not necessary between the two receivers.
3. Modifications are not necessary in the old receiver.
4. Since most stereo effects are concentrated in the middle audio frequency range, the multiplex receiver can be a small table model, this allows greater flexibility in the placement of the multiplexer.

The new multiplexer not only has a switch that will allow you to play either left or right information, it also has a monaural position. When this selector switch is placed in this "M" position, the instrument becomes a complete FM monaural receiver for use as a spare instrument.

CHANNEL SWITCHING

Basically, Chassis 9H22 is a complete stereophonic receiver with an audio switching system at the output of the multiplex detector. Position No. 1 allows L (left) channel information to be fed to the audio system and speaker. Position No. 2 feeds L + R audio information to the audio amplifier. Position No. 3 feeds R (right) information to the audio system. The triple pole, triple throw channel selector switch also has one additional function... when the switch is in "M" or monaural position, it removes the screen voltage from the 12AU6 19 KC pilot amplifier, causing it to become inoperative, and the receiver then functions as a monaural FM receiver.

In the 12H26 Chassis, the two L – R 38 KC side band voltages and the L + R audio voltages were obtained from the ratio detector, run through the 67KC trap, and then amplified before reinsertion at the L15 detector coil. However, on this model, it is not necessary to amplify these two voltages, therefore, they are fed directly to the center tap of the reinsertion transformer. Since it is still necessary to obtain a separation control voltage that is out of phase with the L + R audio, this voltage is obtained from the opposite side of the ratio detector. Then, by adjusting separation control, R1, we can regulate separation as done in the 12H26 chassis.

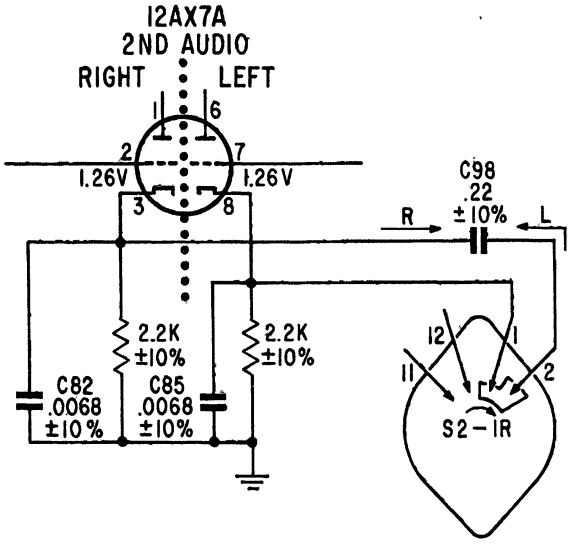
SPEAKER PHASING SWITCH

To operate the Stereo FM Multiplexer properly in conjunction with another monaural FM receiver, it is necessary that the speakers of the FM multiplexer be in phase with the speakers of the monaural FM receiver. Since these instruments were made at various times and also since it is impossible to determine the phase of the speakers beforehand, this instrument has been equipped with a speaker phasing switch, which will enable the operator to reverse the phase of the multiplexer's speakers so they will be co-ordinated with those in the monaural FM receiver.

EXTENDED STEREO OPERATION CHASSIS 4H30 & 14H25

Since stereophonic reproduction depends on the difference in phase between right and left audio channels, anything that can be done to increase this phase difference will result in an extension of the stereo spatial effect. To obtain this aural illusion of extended stereo, a small portion of out of phase components of left (L) information is introduced into the right channel and if simultaneously we introduce a like portion of out of phase components of right (R) information into the left channel, we will fulfill the requirements and obtain the extended spatial effect.

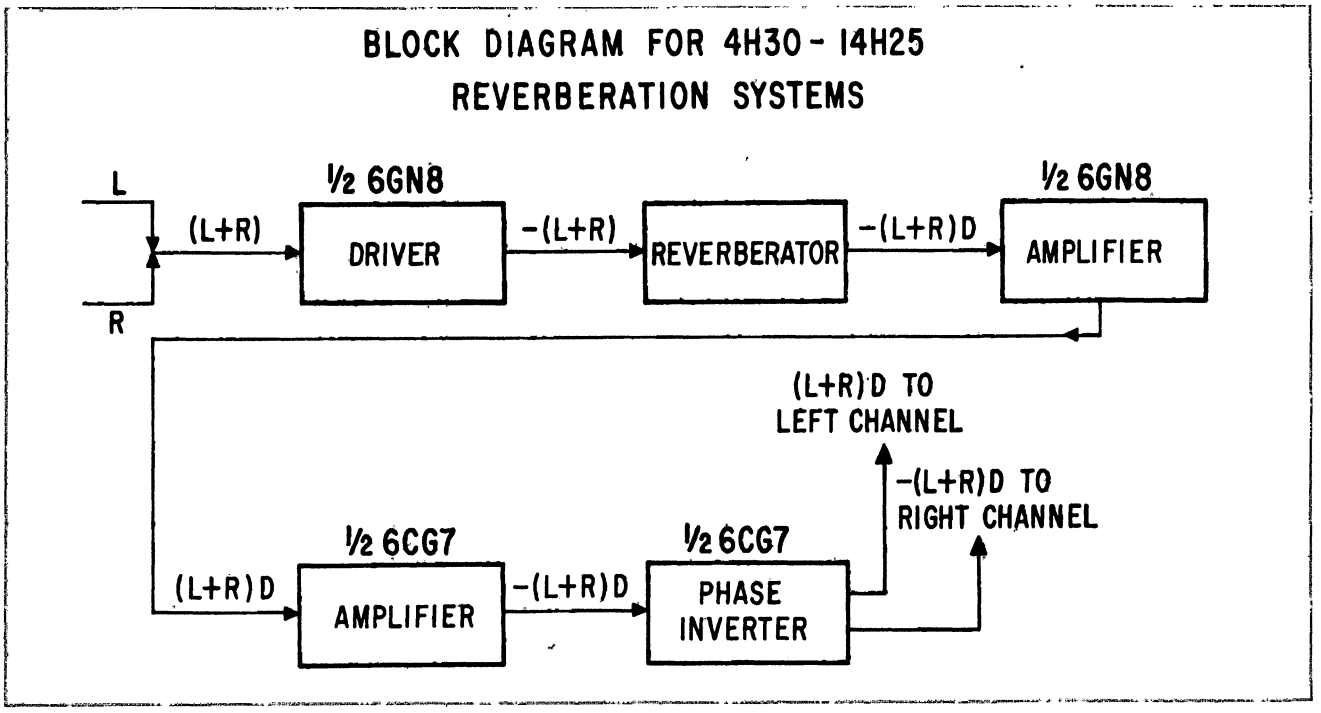
In Chassis 4H30, the cathode of the right channel 12AX7 1st audio tube is connected through a .22 mfd. condenser to the cathode of the left channel 12AX7 1st audio tube. The same thing occurs in Chassis 14H25, except it is done in the cathodes of the 12AX7 left and right 2nd audio amplifiers.

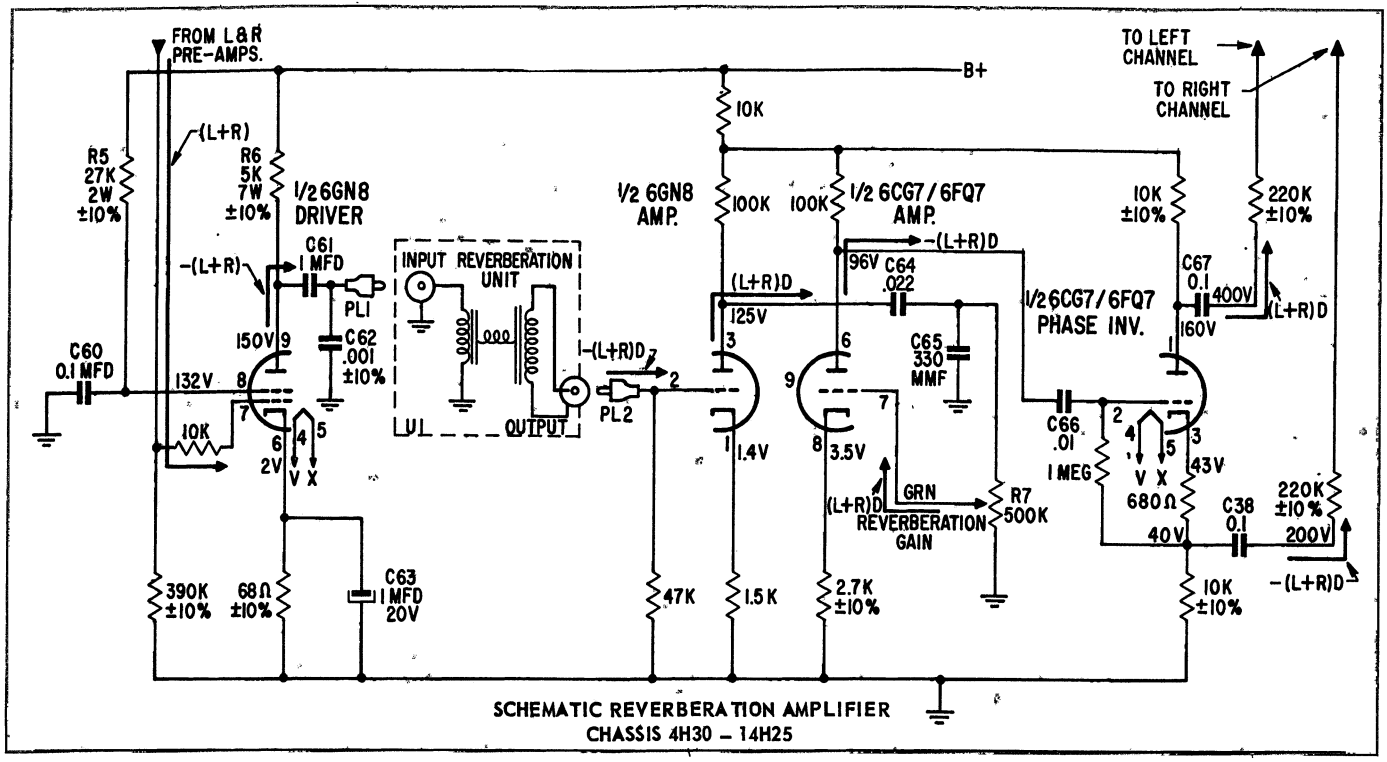


REVERBERATION SYSTEM CHASSIS 4H30 - 14H25

All models using these two chassis have a built-in extended reverberation system. To obtain extended reverberation, it is necessary to create a delayed sum (L + R) D signal and then feed this out of phase to each audio channel. The reverberation portion of Chassis 4H30 and 14H25 obtains R and L information, amplifies this in ½ of the 6GN8 driver which activates the reverberator unit. The L + R information is delayed in the reverberator unit and fed to Pin 2 of the 6GN8 amplifier...the signal is amplified in both the 6GN8 and the following 6CG7 amplifier. The output of the 6CG7 amplifier is fed to Pin 2 of the 6CG7 phase inverter, where a positive portion of (L + R) D from the plate, Pin 1, is fed to the left audio channel, and a negative portion of – (L + R) D from cathode (Pin 3) is fed to the right audio channel.

In this manner, we have fulfilled the requirements for extended reverberation, since we have supplied the left channel with a positive portion of delayed sum signal and to the right channel, we have supplied a negative portion of delayed sum signal.





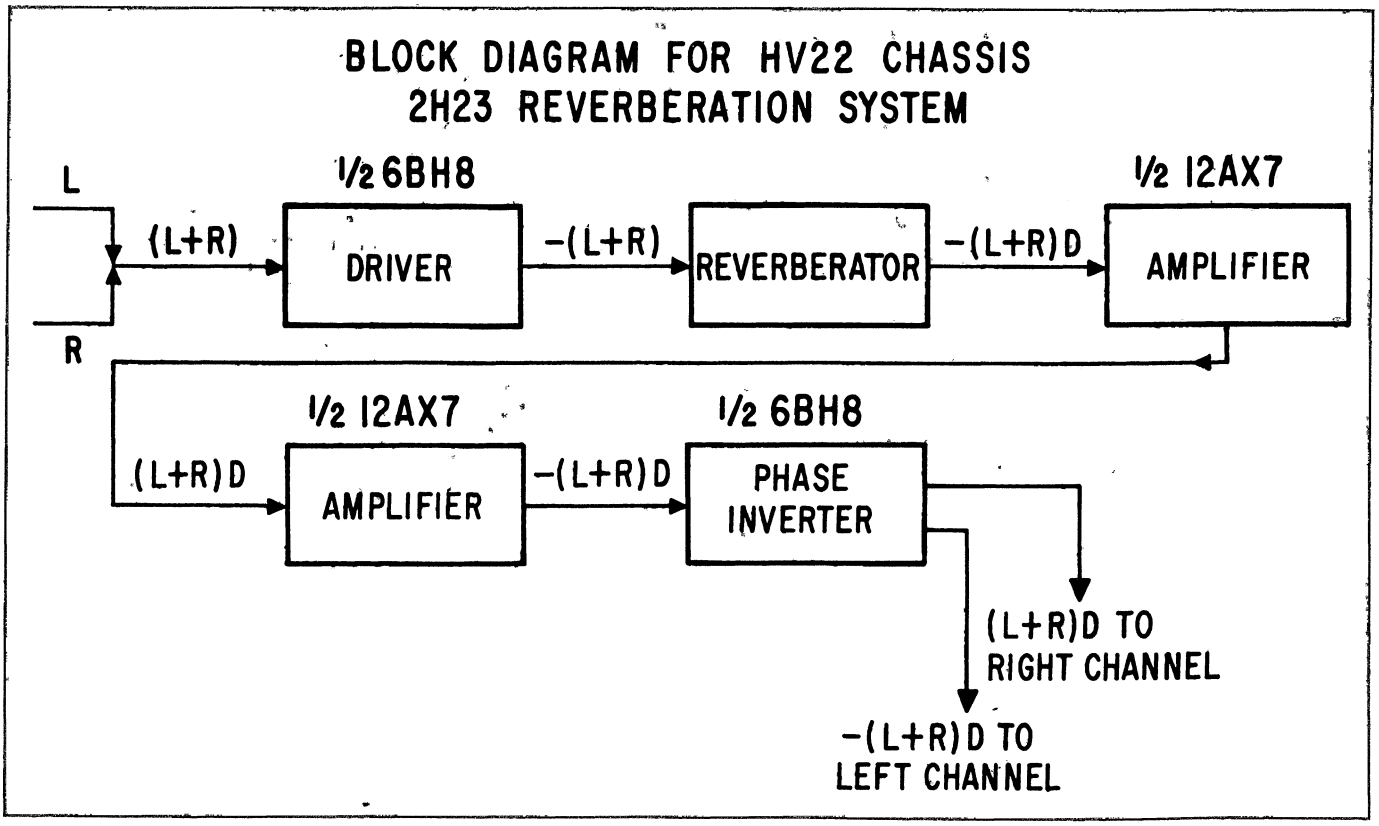
SCHEMATIC REVERBERATION AMPLIFIER
CHASSIS 4H30 – 14H25

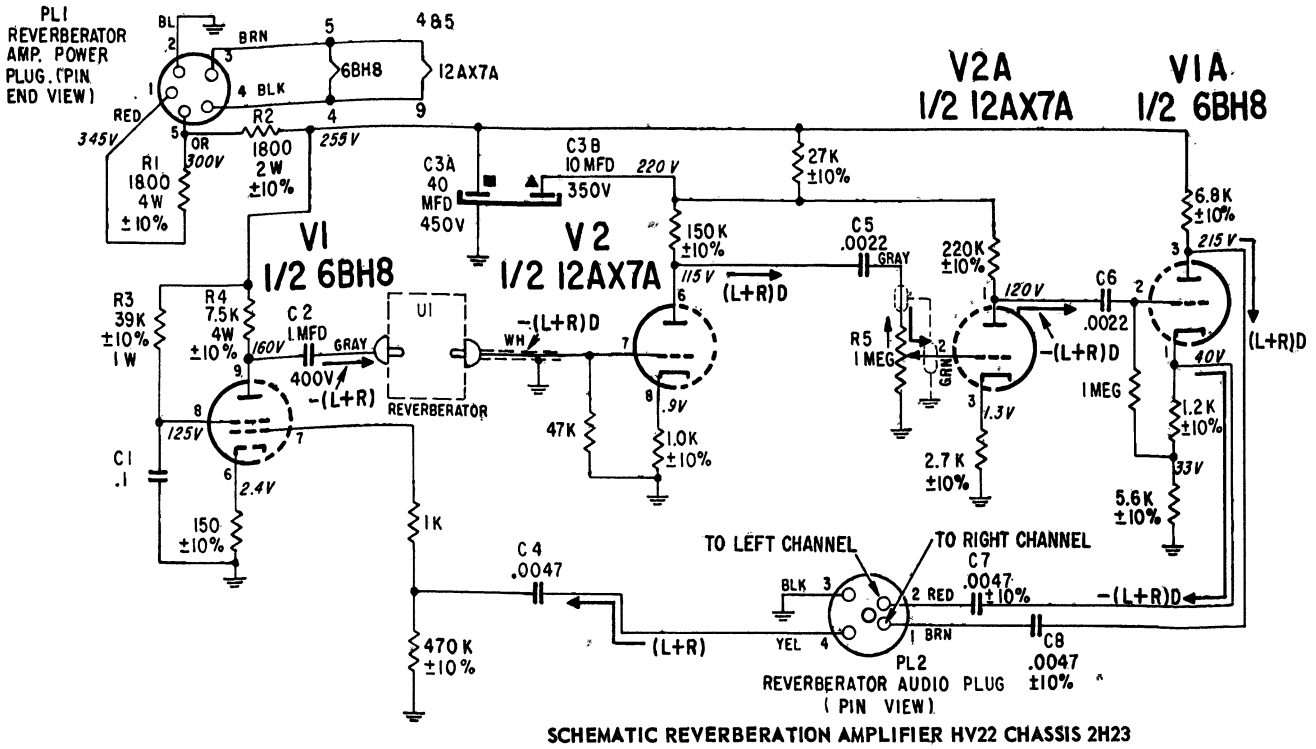
REVERBERATION SYSTEM
MODEL HV22 – CHASSIS 2H23

This extended reverberation kit functions in the same manner as do the systems in Chassis 4H30 and 14H25, except it uses different tubes. This reverberation kit is to be used on any models equipped with an 8H30 Chassis.

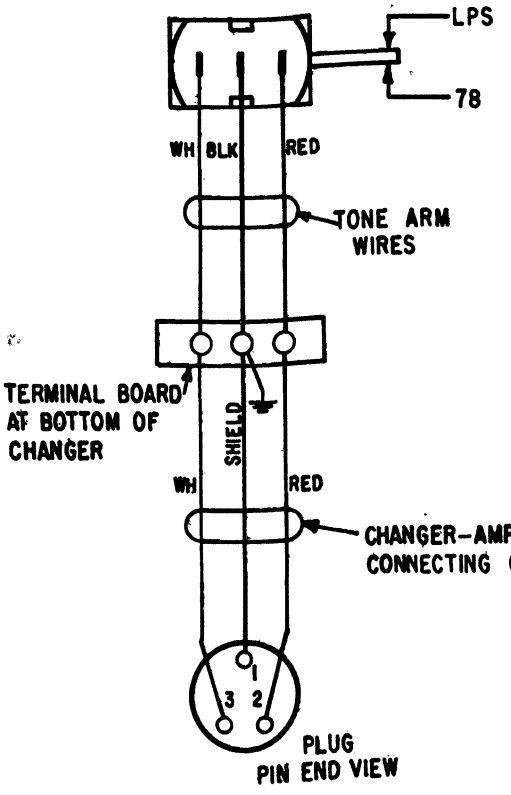
L and R information is obtained from each channel and fed to the grid (Pin 7) of the 6BH8 driver. The output of this tube activates the reverberator unit which delays the signal. This signal is then amplified in the 12AX7A amplifiers and fed to ½ of the 6BH8 phase inverter. A positive portion of (L + R) D from the plate (Pin 3) is fed to the right audio channel, and a negative portion of –(L + R) D from the cathode (Pin 1) is fed to the left audio channel.

In this manner, we have fulfilled the requirements for extended reverberation, since we have supplied the left audio channel with a negative portion of delayed sum signal and to the right audio channel, we have supplied a positive portion of delayed sum signal.

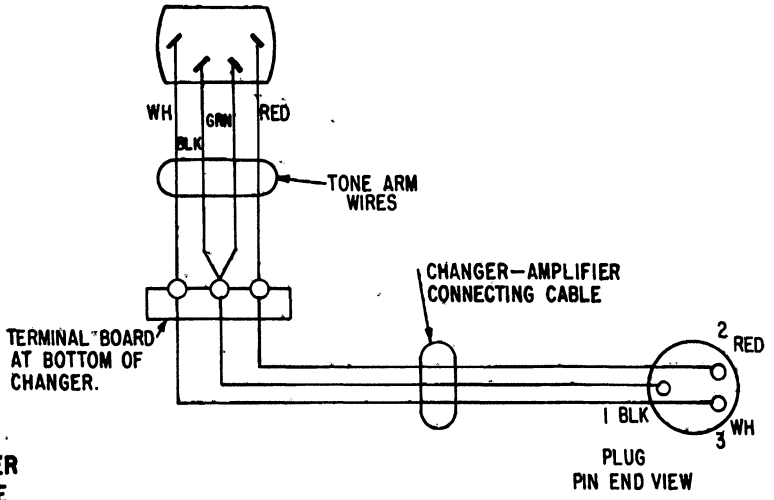




SCHEMATIC REVERBERATION AMPLIFIER HV22 CHASSIS 2H23



142-117,-118 Cartridge
Connections Rear View



142-110,-111-121 Cartridge Connections Rear View

MUTING CONTROL

The 25 K muting control which supplies a back bias voltage to the cathode of the 19 KC pilot amplifier is factory adjusted, and should not require readjustment. However, if the receiver is operated in an extremely noisy area, there is a possibility that there may be noise bursts of sufficient magnitude to overcome this mute voltage ... when this occurs, the Stereophonic FM Indicator will light up. To further cut off the 19 KC pilot amplifier, carefully rotate the 25 KC muting control in a counter-clockwise direction. This should only be done when a stereo signal is on the air since the mute control must only be advanced to a point where the Stereo Indicator does not light up on noise, but it should not be advanced to a point where the desired stereo signal is cut off.

MULTIPLEX ALIGNMENT

These receivers have been properly aligned at the factory and will not require further adjustment. As a result, it is not recommended that any attempt be made to alter the multiplex stages. However, should any major components in these circuits require replacement then, of course, realignment will be necessary.

At the present time test equipment is not available, therefore, we have not included multiplex alignment procedure. However, as soon as qualified equipment is available, we shall supplement this manual with multiplex alignment procedures.

ANTENNAS FOR STEREO FM

Due to the characteristics of the stereo FM system, it will require more signal for proper performance than does monaural FM. As a result, it may be necessary to operate the stereo FM receiver with an external antenna. The necessity for an external antenna will be determined by the signal conditions at each individual installation.

EXTERNAL FM ANTENNA

If the receiver is operated in an area of either low signal strength, high noise, or where multipath (FM ghosts) signals are present, a good external FM antenna will be required. The necessity of an external antenna as a result of weak signal or noise, will be quite evident since the set will not limit, and/or noise will be quite evident. It is extremely difficult to determine if multipath (FM ghosts) signals are present, however, should the program material be distorted, the best manner to decide if multipath signals are the cause of the problem, is to connect an external FM antenna to the receiver. Usually a TV antenna may be available for trial, but even then the results can be misleading, since many TV antennas are of low gain on FM frequencies.

FM LINE CORD ANTENNA

The built-in line cord antenna will usually give satisfactory reception in many locations provided the line cord is unhanked and stretched out in back of the receiver; do not coil or bunch it up. Also, try the plug both ways in the power socket for the position which gives best FM reception.

FM CABINET ANTENNA

Models MH2635, MH2670, MH2675, and MH2685 all contain an FM antenna built into the cabinet. This antenna consists of a length of wire cut to the desired frequency, and attached to the internal periphery of the cabinet.

SIGNAL STRENGTH CHART

There are certain minimum voltages necessary for proper stereo FM reception. To help determine if there is sufficient signal available, the following developed AGC voltage versus microvolt input voltage charts have been compiled. Since the desired FM Station may not always be operating in the stereo mode when an installation is made, these AGC voltage measurements have been taken with a monaural FM signal. The point "*" of minimum AGC voltage necessary for good stereo FM reception has been indicated on these charts. For chassis 9H20, 9H21, 12H26, and 14H25, connect a V.T.V.M. to the rear terminal of the FM antenna coil. This is the AGC line connected to Pin #2 of the 6JK8 RF amplifier. On chassis 9H22 this test point is the AGC feed-through condenser leading to a 1 megohm resistor and then to Pin #7 of the 12DT8 RF amplifier. This feed-through condenser is on top of the chassis adjacent to both the FM antenna coil and the 12DT8 RF amplifier. It has a yellow lead connected to it.

Chassis 9H20-21

Micro-volts Input	AGC Voltage at RF Coil
0	.8
25	.95
50	1.27
100	1.6
200	1.95
500	2.35
1 K	*2.7
5 K	3.6
10 K	4.0
20 K	4.5
50 K	5.1
100 K	5.6

Chassis 9H22

Micro-volts Input	AGC Voltage at Tuner Feed-Thru
0	.64
10	.75
25	1.04
50	1.4
100	1.75
200	2.05
1 K	*2.75
5 K	3.3
10 K	3.5
20 K	3.75
50 K	4.05
100 K	4.30

Chassis 12H26-14H25

Micro-volts Input	AGC Voltage at RF Coil
0	.75
10	.82
20	.9
50	1.32
100	1.72
200	2.1
500	2.6
1 K	*2.95
2 K	3.3
5 K	3.85
10 K	4.3
20 K	4.8
50 K	5.3
100 K	6.0

FM, RF, AND IF ALIGNMENT

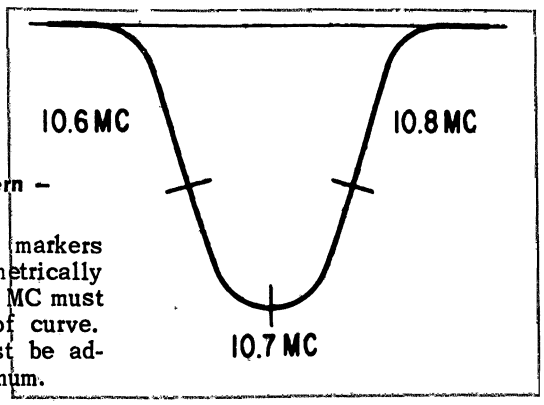
Alignment of this chassis will, in most cases, not be necessary unless an RF or IF transformer is replaced or if someone has tampered with the adjustments.

Because of the wide band pass required in the multiplex FM tuner, it is desirable to use an FM signal generator having a deviation of 200 KC with a sweep rate of 60 cycles as well as an oscilloscope when aligning both the IF and RF FM portions of this receiver. It is not only necessary to obtain maximum amplitude in the IF amplifier stages, but also necessary to maintain symmetry. To help achieve this symmetry, it is desirable to have 10.6, 10.7, and 10.8 megacycle markers in obtaining IF curve symmetry. The scope pattern example illustrating marker use to obtain this symmetry, is in illustration B.

The condenser mentioned further on in the alignment procedure should be as small as possible and the ground lead of the generator must be connected to the chassis at the base of the tube socket, where the signal is being injected. Should the signal be injected at some point other than a tube socket, then the ground lead should be connected to ground as closely as possible to this point.

In all alignment procedures, the signal generator output should be kept just high enough to obtain an indication on the meter. This is most necessary, since on some chassis we have a zero time constant limiter which will clip the signals if their magnitude is too great, resulting in erroneous waveforms.

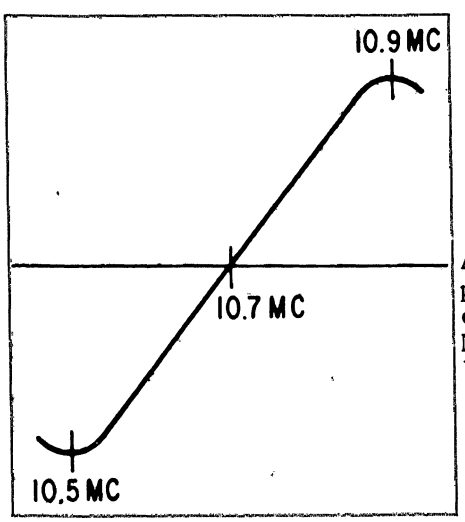
A. Connect scope or V.T.V.M. to Pin #1 6AU6 or 12AU6 limiter. The negative scope or V.T.V.M. terminal should be connected to chassis.



Scope Pattern –

10.6 and 10.8 markers must be symmetrically positioned. 10.7 MC must be at center of curve. This point must be adjusted for maximum.

B. Connect scope or V.T.V.M. to junction of 100 ohm and 330 mmf capacitor. This 100 ohm resistor is connected to terminal #6 of the ratio detector transformer.



Scope Pattern –

Adjust for maximum a
plitude and maintain l
earity and symmetry. 1(
MC must be on curve
base line.

AM ALIGNMENT

C. An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM, IF, and RF adjustments.

NEUTRALIZING 6JK8 R.F. AMPLIFIER

1. Tune receiver to 108 mc.
2. Insert a 108 mc R.F. signal at FM-G antenna terminals.
3. Connect V.T.V.M. or scope to Pin #1 grid of the 6AU6 limiter. The negative scope or V.T.V.M. terminal should be connected to chassis.
4. Remove the AGC line from the tuner feed through and connect the (–) negative lead of the bias supply to this point. Connect the (+) terminal to chassis.
5. Adjust the bias supply to approximately -10 volts.
6. Carefully vary the position of the two wires adjacent to the body of C5 until minimum output is obtained.

OPERATION	CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	SET DIAL TO	ADJUST IRON CORES	PURPOSE
1 B	Pin # 1 6AU6 Limiter Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L15	Adjust primary and secondary of ratio detector for maximum amplitute and symmetry as shown in Scope Pattern "B"
2 B	Pin #1 6AU6 Limiter Grid	.001 mfd	10.7 Mc 200 Kc. Deviation	88 Mc.	L17	
3 A	Pin #1 6BA6 2nd I.F. Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L11, L12	Align I.F. transformers for maximum output and symmetry; this pattern is not necessarily identical to the over all Scope Pattern "A"
4 A	Pin #1 6BA6 1st I.F. Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L7, L8	
5 A	Junction C9, C10 and L2 FM Detector Coil	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L4, L5	Align I.F. transformers for maximum out & symmetry as indicated in Scope Pattern "A"
6 A		.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	Readjust L4, L5, L7, L8, L11, L12	
7 A	FM Antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L3	Set Oscillator to dial scale
8 A	FM Antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L2 & L1	Align detector and antenna stages for maximum
9 C	Pin # 6BE6 Converter Grid	.05	455 Kc. 400 Cycle Modulated	600 Kc.	L21, L22, L9, L10, L13, L14	Align AM, I.F. for maximum
10 C	Two turn loop loosely coupled to Wavemagnet		1600 Kc. 400 Cycle Modulated	1600 Kc.	C34F	Set oscillator to dial scale
11 C	Two turn loop loosely coupled to Wavemagnet		1400 Kc. 400 Cycle Modulated	1400 Kc.	C34D, C34B	Align detector and antenna stages.

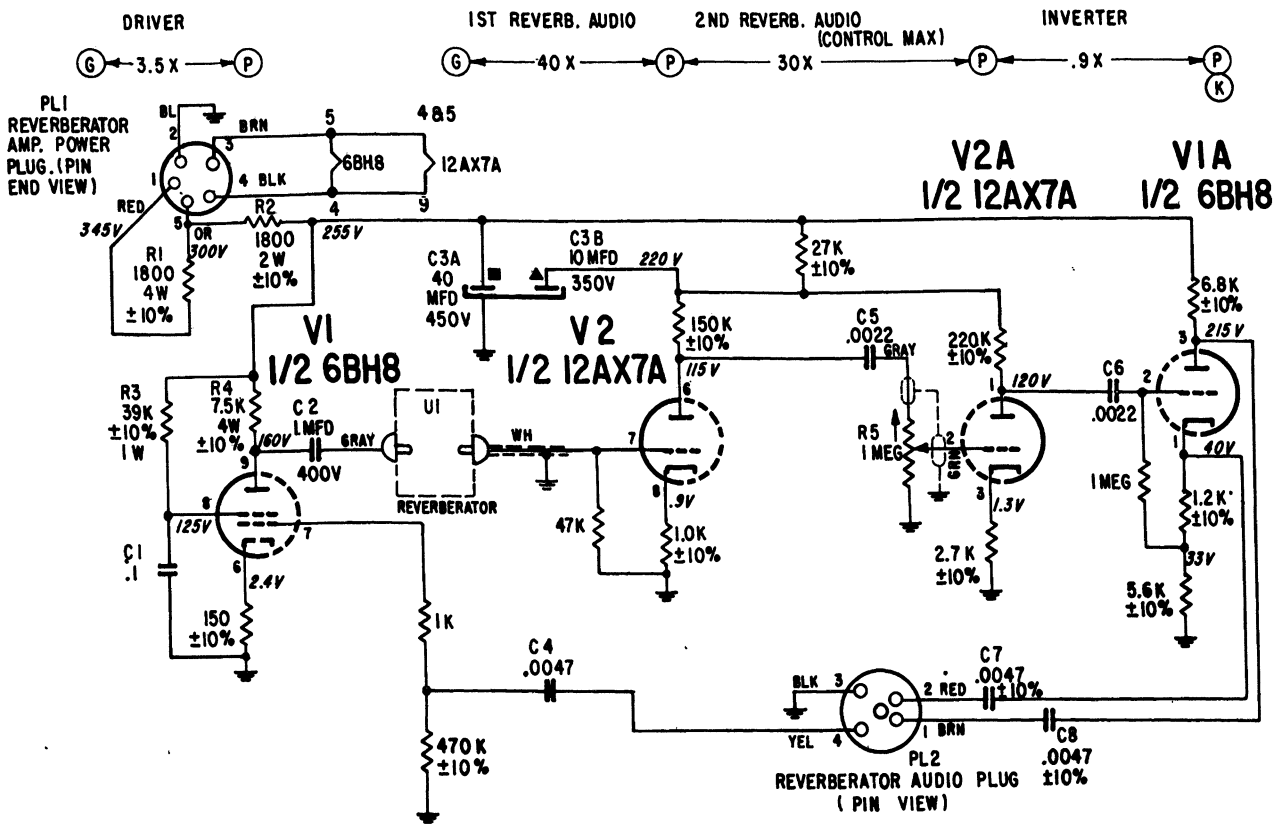
* For A, B, C See Page 25

OPERATION	CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	SET DIAL TO	ADJUST IRON CORES	PURPOSE
1B	Pin #1 12AU6 Limiter Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L10	Adjust primary and secondary of ratio detector for maximum amplitude and symmetry as shown in Scope Pattern "B"
2B	Pin #1 12AU6 Limiter Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L11	
3A	Pin #1 6BJ6 2nd I.F. Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L8, L9	Align IF transformers for maximum output and symmetry. This pattern is not necessarily identical to the overall Scope Pattern "A"
4A	Pin #1 6BJ6 1st I.F. Grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 mc.	L6 & 7	
5A	Junction C6, C8 & L2 FM Detector Coil	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L4 & L5	Align I.F. transformers for maximum output and symmetry as indicated in Scope Pattern "A".
6A	Junction C6, C8 & L2 FM Detector Coil	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	Readjust L4, L5, L6, L7, L8 & L9	
7A	FM Antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L3	Set oscillator to Dial Scale
8A	FM Antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L2	Align detector stage for maximum

* For A, B, C See Page 25

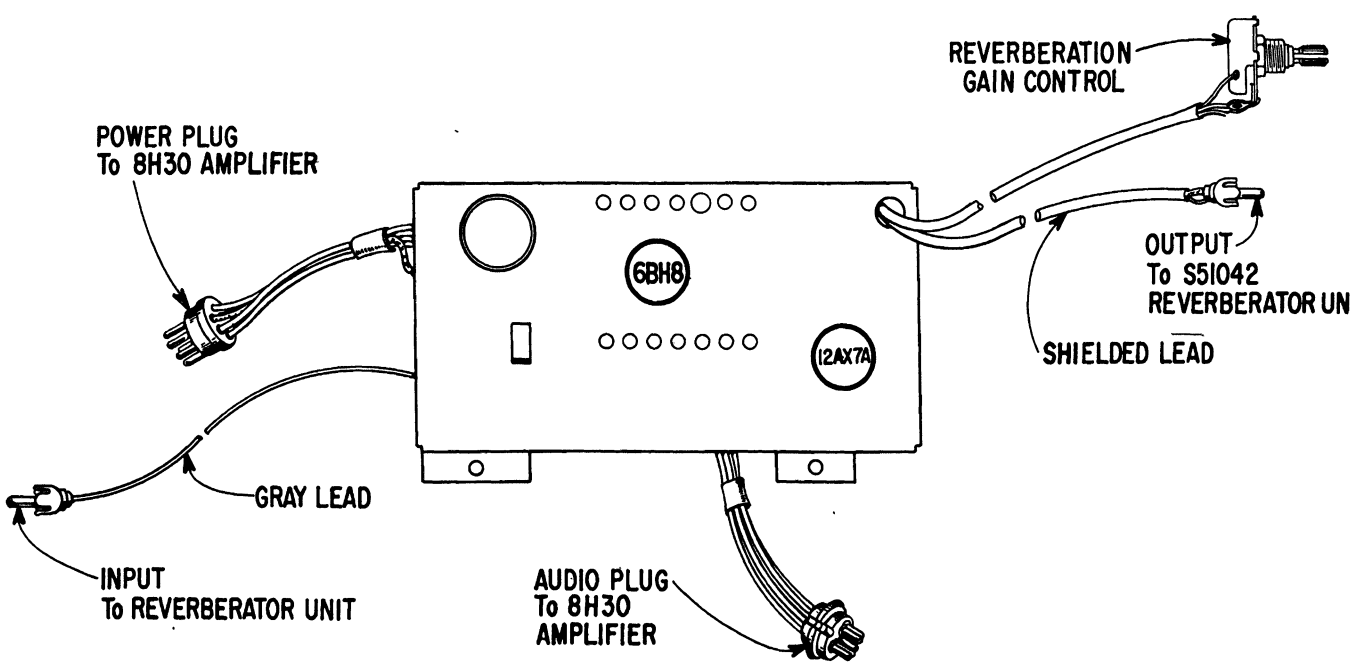
OPERATION	CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	SET DIAL TO	ADJUST IRON CORES	PURPOSE
1 B	Pin #1 6AU6 2nd limiter grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L11	Adjust primary and secondary of ratio detector for maximum amplitude & symmetry as shown in Scope Pattern "B"
2 B	Pin #1 6AU6 2nd limiter grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L13	
3 A	Pin #2 6BN6 1st limiter grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L10	Align I.F. transformers for maximum output & symmetry This pattern is not necessarily identical to the overall Scope Pattern "A"
4 A	Pin #2 6EQ7 2nd I.F. grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L8, L9	
5 A	Pin #1 6BA6 1st I.F. grid	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L6, L7	
6 A	Junction C9, C10 and L2 FM Detector Coil	.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	L4, L5	Align I.F. transformers for maximum output & symmetry as indicated in Scope Pattern "A"
7 A		.001 mfd	10.7 Mc. 200 Kc. Deviation	88 Mc.	Readjust L4, L5, L6, L7, L8, L9, L10	
8 A	FM antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L3	Set oscillator to dial scale
9 A	FM antenna post (remove line antenna)	300 ohms	98 Mc. 200 Kc. Deviation	98 Mc.	L2 & L1	Align detector and antenna stages for maximum.
10 C	Pin #1 6BE6 converter grid	.05	455 Kc. 400 Cycle Modulated	600 Kc.	L21, L22, L14, L15, L16, L17	Align AM I.F. for maximum
11 C	Two turn loop loosely coupled to wavemagnet		1600 Kc. 400 Cycle Modulated	1600 Kc.	C38F	Set oscillator to dial scale
12 C	Two turn loop loosely coupled to wavemagnet		1400 Kc. 400 Cycle Modulated	1400 Kc.	C38D & C38B	Align detector and antenna stages

* For A, B, C See Page 25



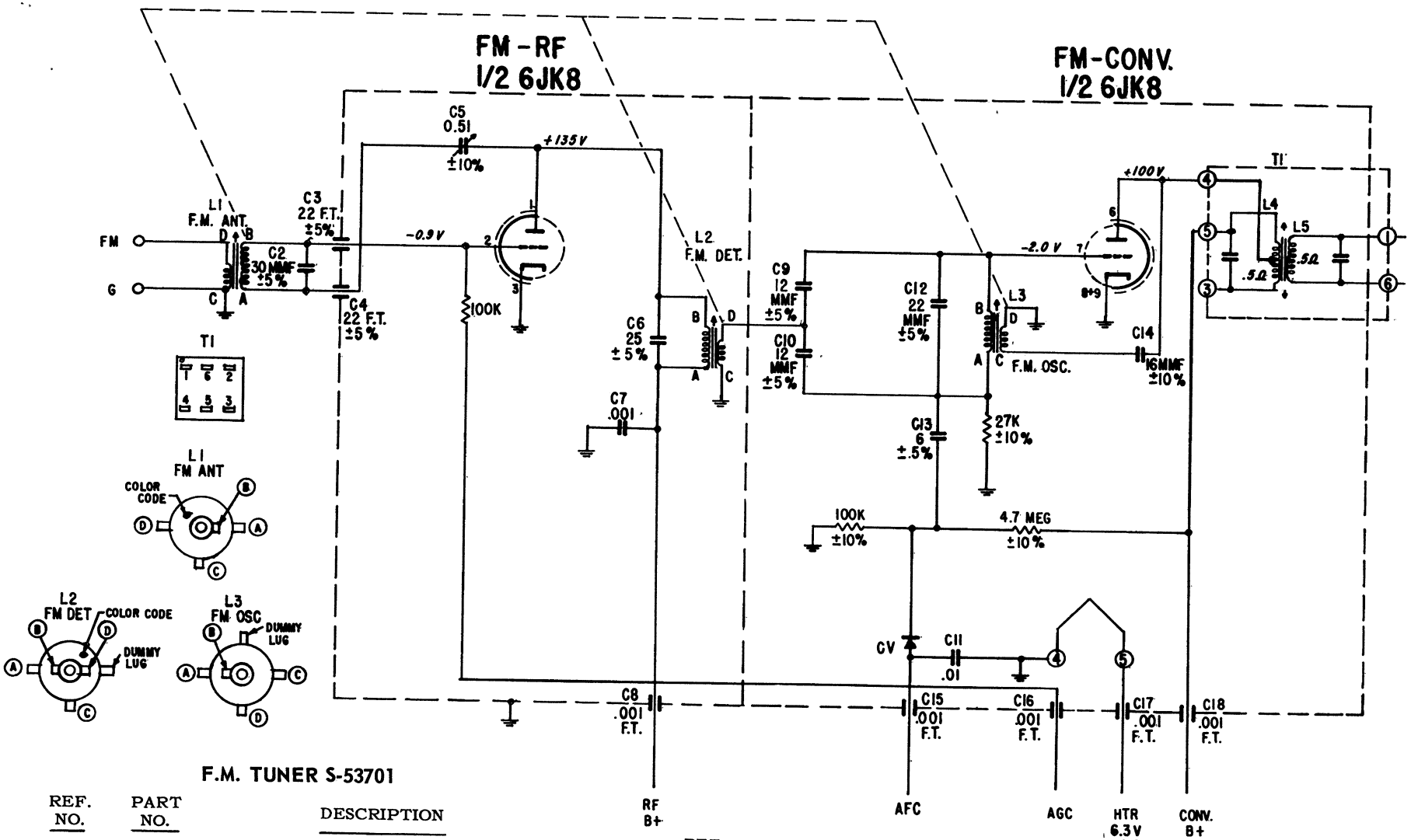
(USED WITH 8H30 STEREO AMPLIFIER CHASSIS)

2H23 SCHEMATIC FOR HV22



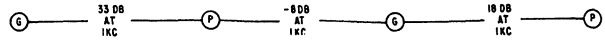
2H23 TUBE LAYOUT FOR HV22

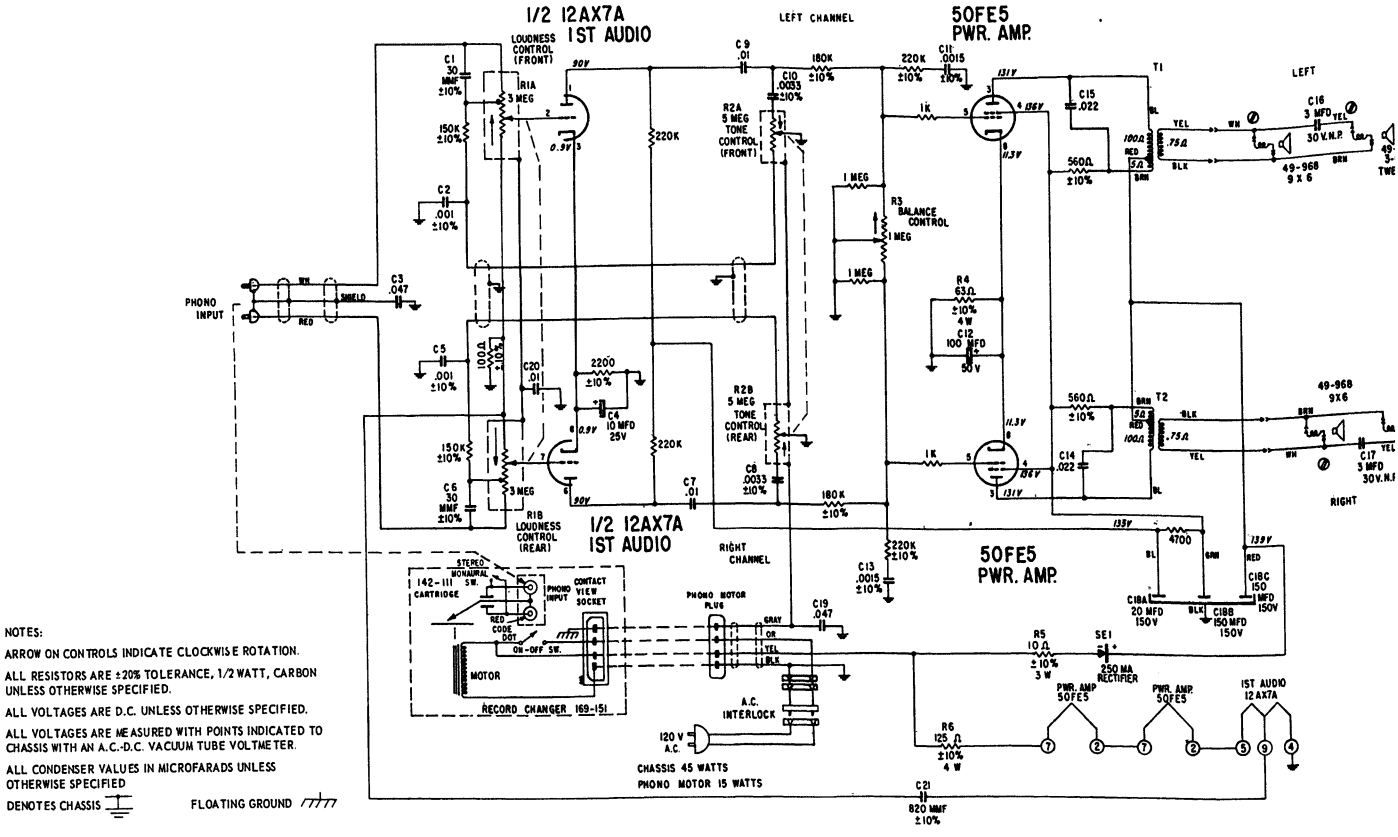
SCHEMATIC FOR S-53701 FM TUNER USED WITH CHASSIS 9H20, 9H21, 12H26 & 14H25



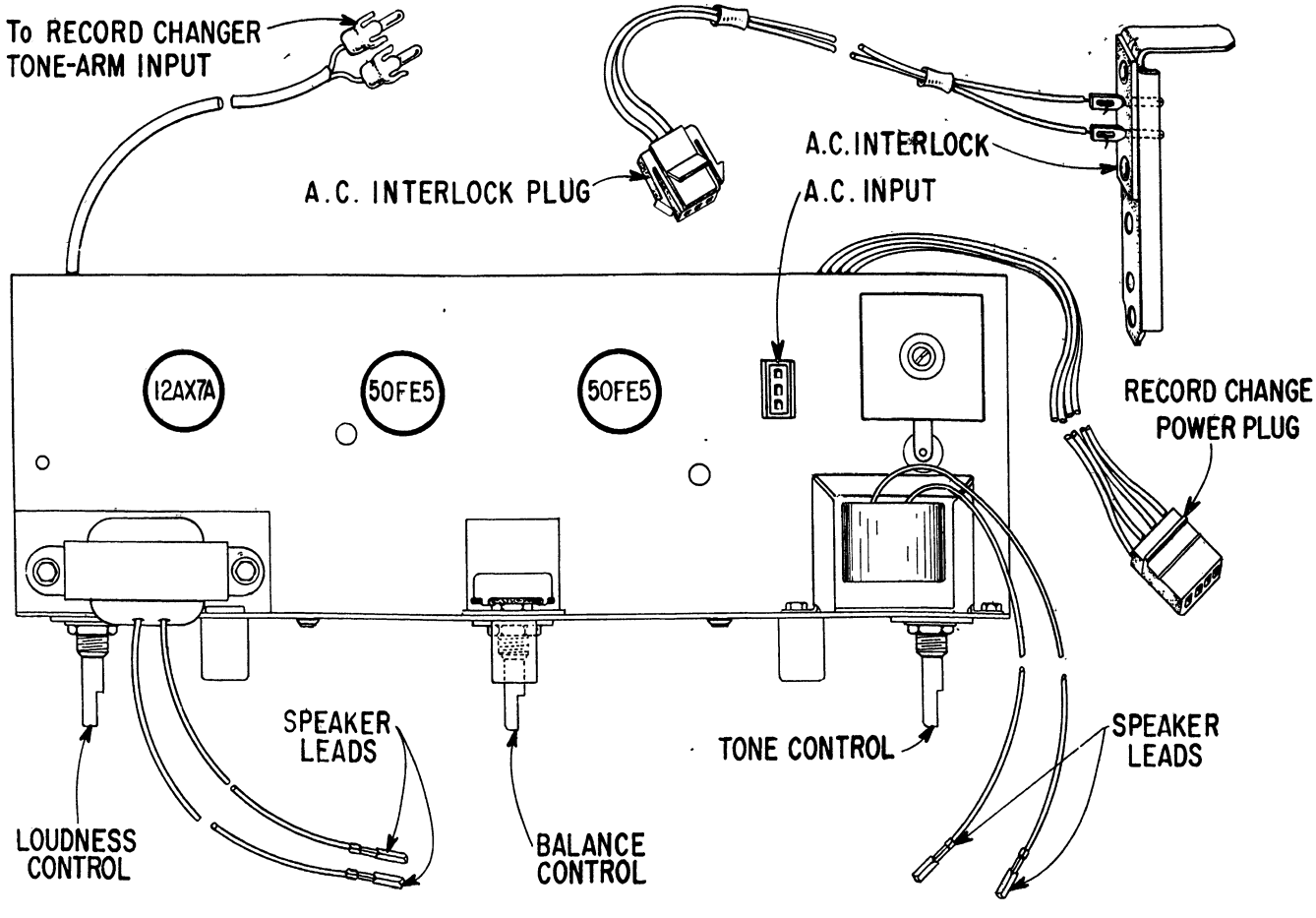
F.M. TUNER S-53701

REF. NO.	PART NO.	DESCRIPTION	
C2	22-2550	30 Mmfd. Ceramic Disc Cap.	500 V
C3	22-3270	22 Mmfd. F.T. Cap.	500 V
C4	22-3270	22 Mmfd. F.T. Cap.	500 V
C5	22-2676	0.51 Mmfd. Gimmick Cap.	500 V
C6	22-3232	25 Mmfd. Ceramic Disc Cap.	500 V
C7	22-1888	.001 Mfd. Ceramic Cap.	500 V
C8	22-2732	.001 F.T. Cap.	500 V
C9	22-3035	12 Mmfd. Ceramic Disc Cap.	500 V
C10	22-3035	12 Mmfd. Ceramic Disc Cap.	500 V
C11	22-3010	.01 Mfd. Ceramic Cap.	25 V
C12	22-3621	22 Mmfd. Ceramic Disc Cap.	500 V
C13	22-2374	6 Mmfd. Ceramic Disc Cap.	500 V
C14	22-2896	16 Mmfd. Ceramic Disc Cap.	500 V
C15	22-2732	.001 F.T. Cap.	500 V
C16	22-2732	.001 F.T. Cap.	500 V
C17	22-2732	.001 F.T. Cap.	500 V
C18	22-2732	.001 F.T. Cap.	500 V
L1	S-14192	F.M. Ant. Coil	
L2	S-13871	F.M. Det. Coil	
L3	S-52359	F.M. Osc. Coil	
L4	IN T1	1st FM I.F. Primary	
L5	IN T1	1st FM I.F. Secondary	
T1	95-1900	1st FM I.F. Transformer 10.7 M.C.	
CV	103-39	A.F.C. Diode	



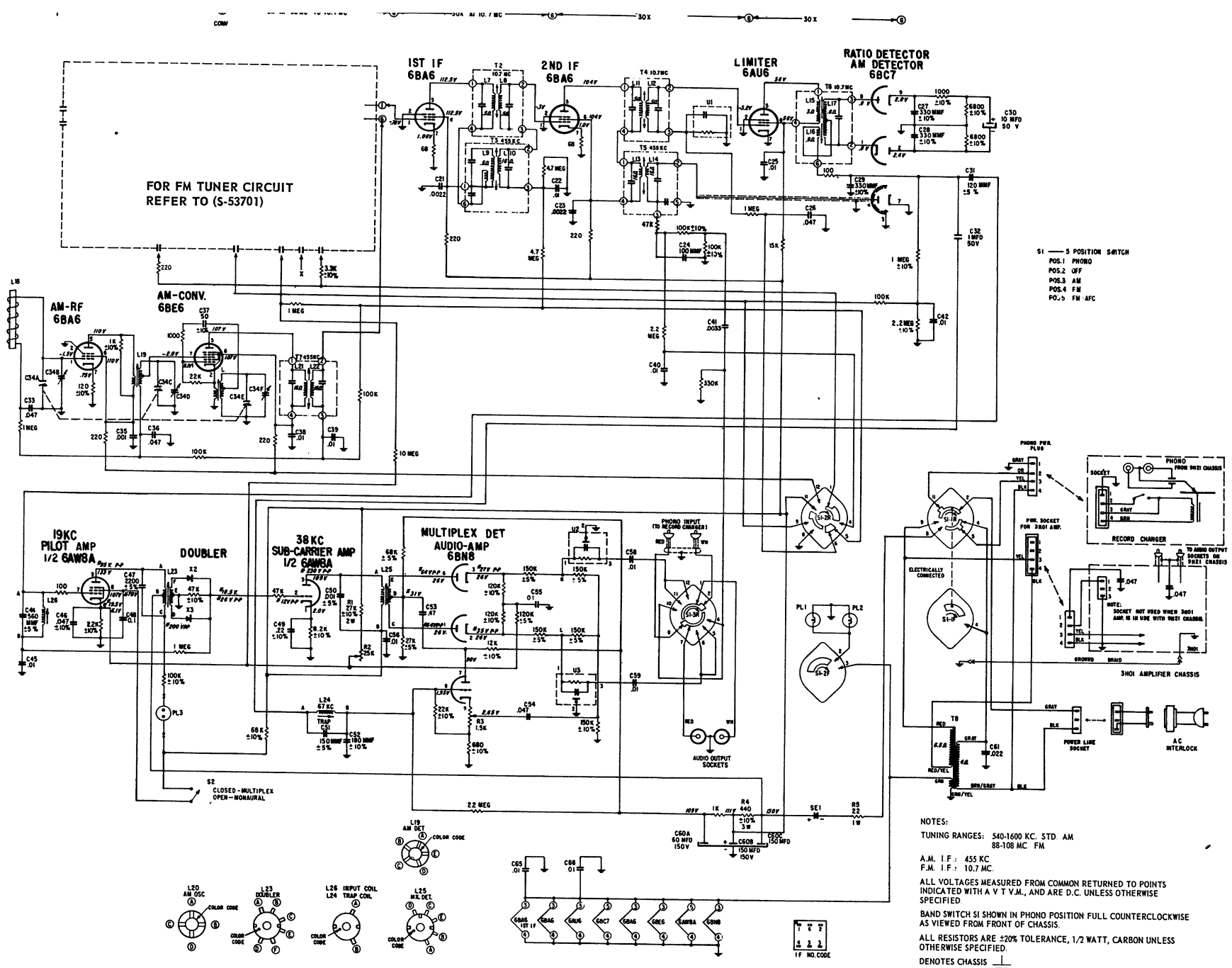


3H01 SCHEMATIC FOR MODELS SFH2500T & MH2600



3H01 TUBE LAYOUT FOR MODELS SFH2500T & MH2600

9H21 SCHEMATIC FOR MHT-14 TUNER USED ON MODELS SFH2500T & MH2600



NOTES:

TUNING RANGES: 540-1600 KC. STD. AM.
88-108 MC. FM

A.M. I.F.: 455 KC
F.M. I.F.: 10.7 MC.

ALL VOLTAGES MEASURED FROM COMMON RETURNED TO POINTS INDICATED WITH A V T V.M., AND ARE D.C. UNLESS OTHERWISE SPECIFIED.

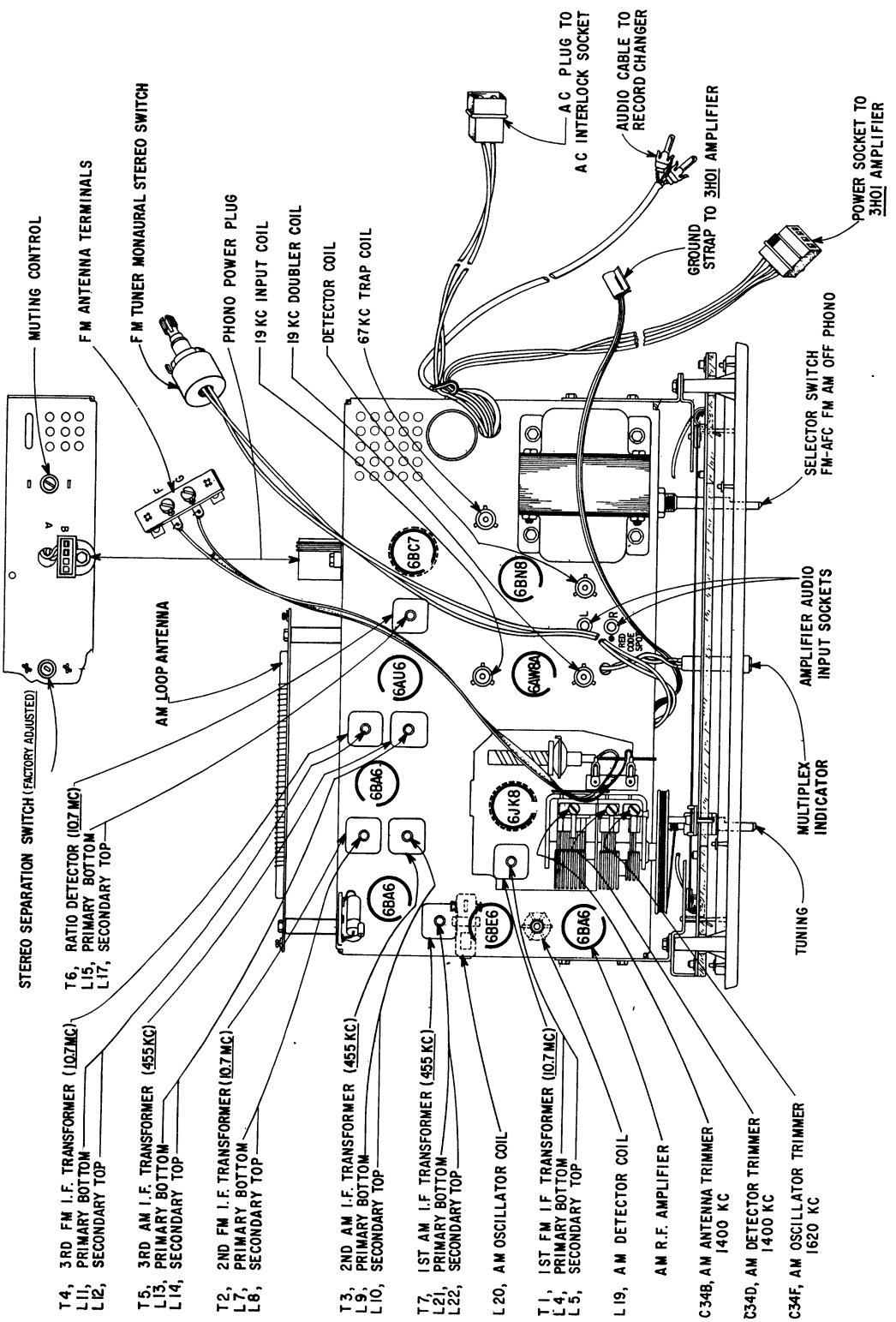
BAND SWITCH S1 SHOWN IN PHONO POSITION FULL COUNTERCLOCKWISE AS VIEWED FROM FRONT OF CHASSIS.

ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED.

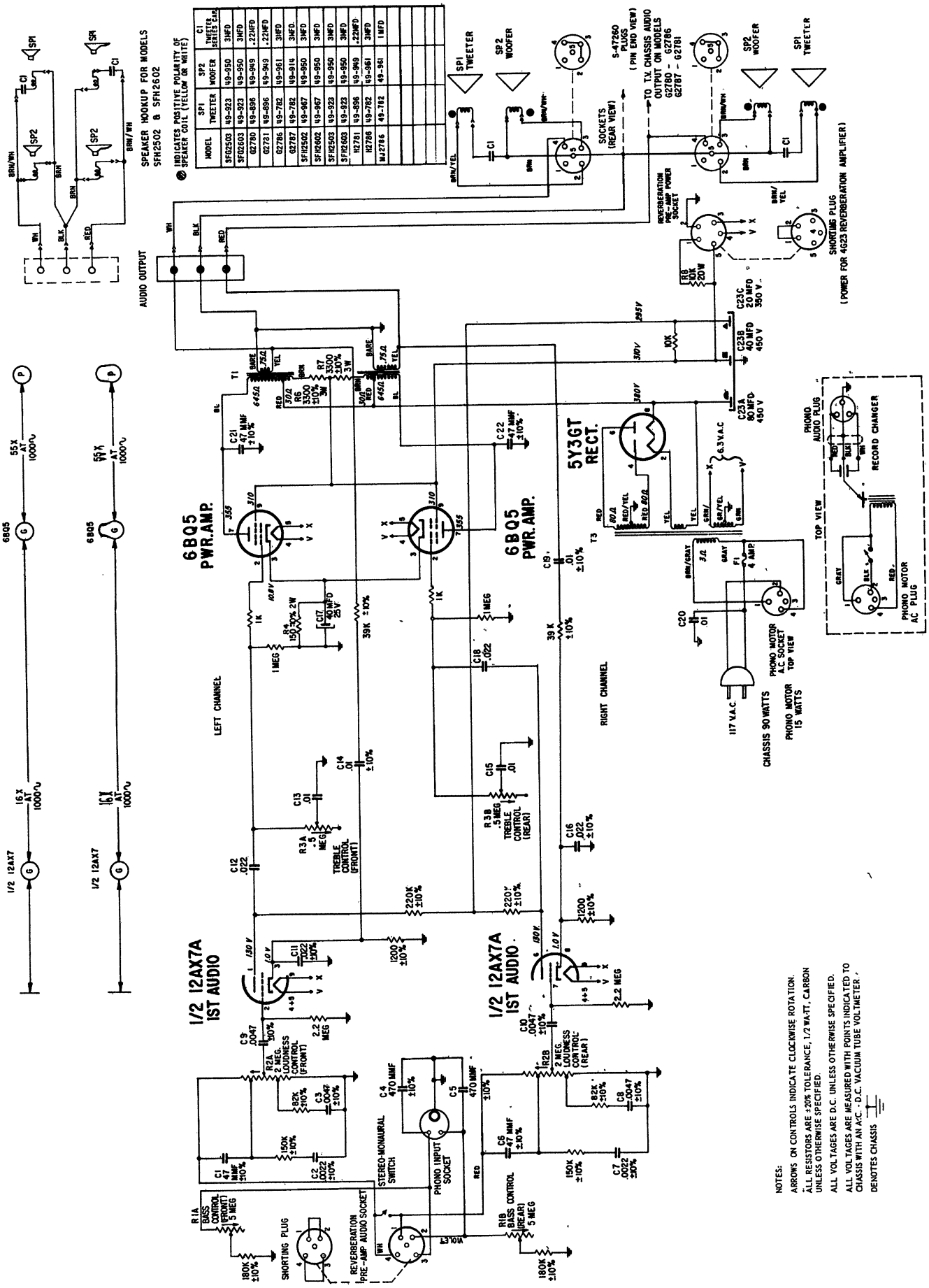
DENOTES CHASSIS

*PRESENT ONLY WITH STEREO SIGNAL.

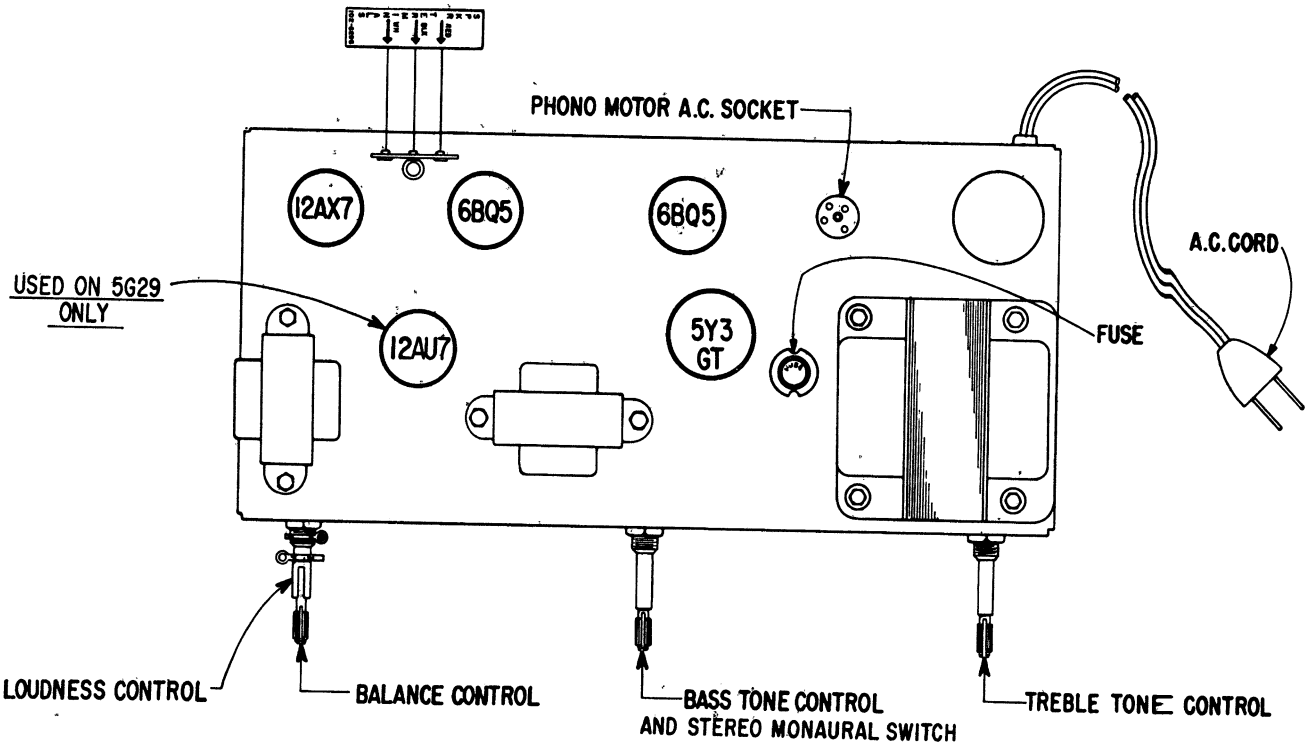
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

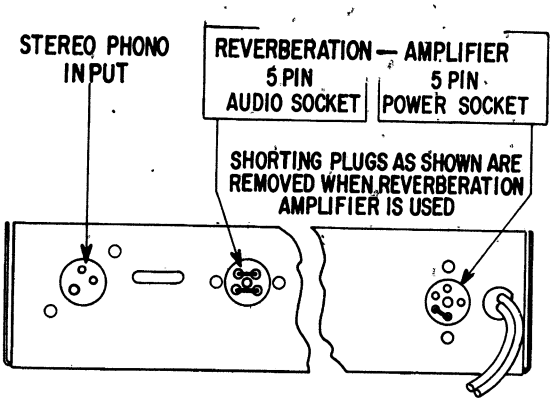


9H21 TUBE LAYOUT FOR MHT-14 TUNER USED ON MODELS SFH2500T & MH2600



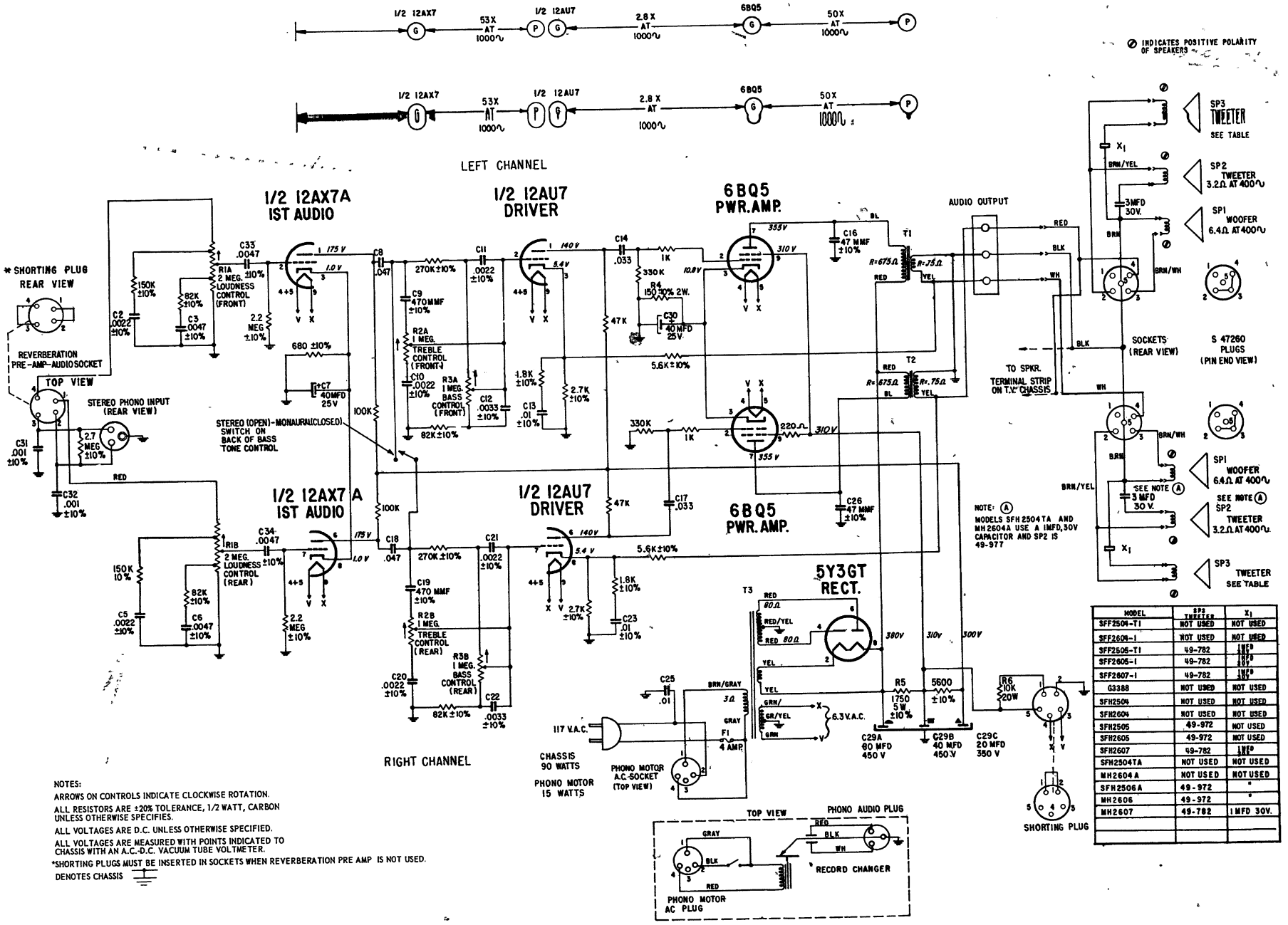
4G21 SCHEMATIC FOR MODELS SFH2502T, MH2602, SFH2503T, MH2603 & MH2786





4G21-5G29 TUBE LAYOUT FOR MODELS SFH2502T, MH2602, SFH2503T, MH2603 SFH2504T, MH2604, SFH2505T, MH2605, MH2607 & MH2786

5G29 SCHEMATIC FOR MODELS SFH2504T, MH2604, SFH2505T, MH2605 & MH2607



MODEL	SP3 TWEETER	X1
SFF2504-T1	NOT USED	NOT USED
SFF2604-1	NOT USED	NOT USED
SFF2605-T1	49-782	1MFD 30V
SFF2605-1	49-782	1MFD 30V
SFF2607-1	49-782	1MFD 30V
G3388	NOT USED	NOT USED
SFH2504	NOT USED	NOT USED
SFH2604	NOT USED	NOT USED
SFH2505	49-972	NOT USED
SFH2605	49-972	NOT USED
SFH2607	49-782	1MFD 30V
SFH2504TA	NOT USED	NOT USED
MH2604A	NOT USED	NOT USED
SFH2506A	49-972	"
MH2606	49-972	"
MH2607	49-782	1 MFD 30V.

NOTES:

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION.

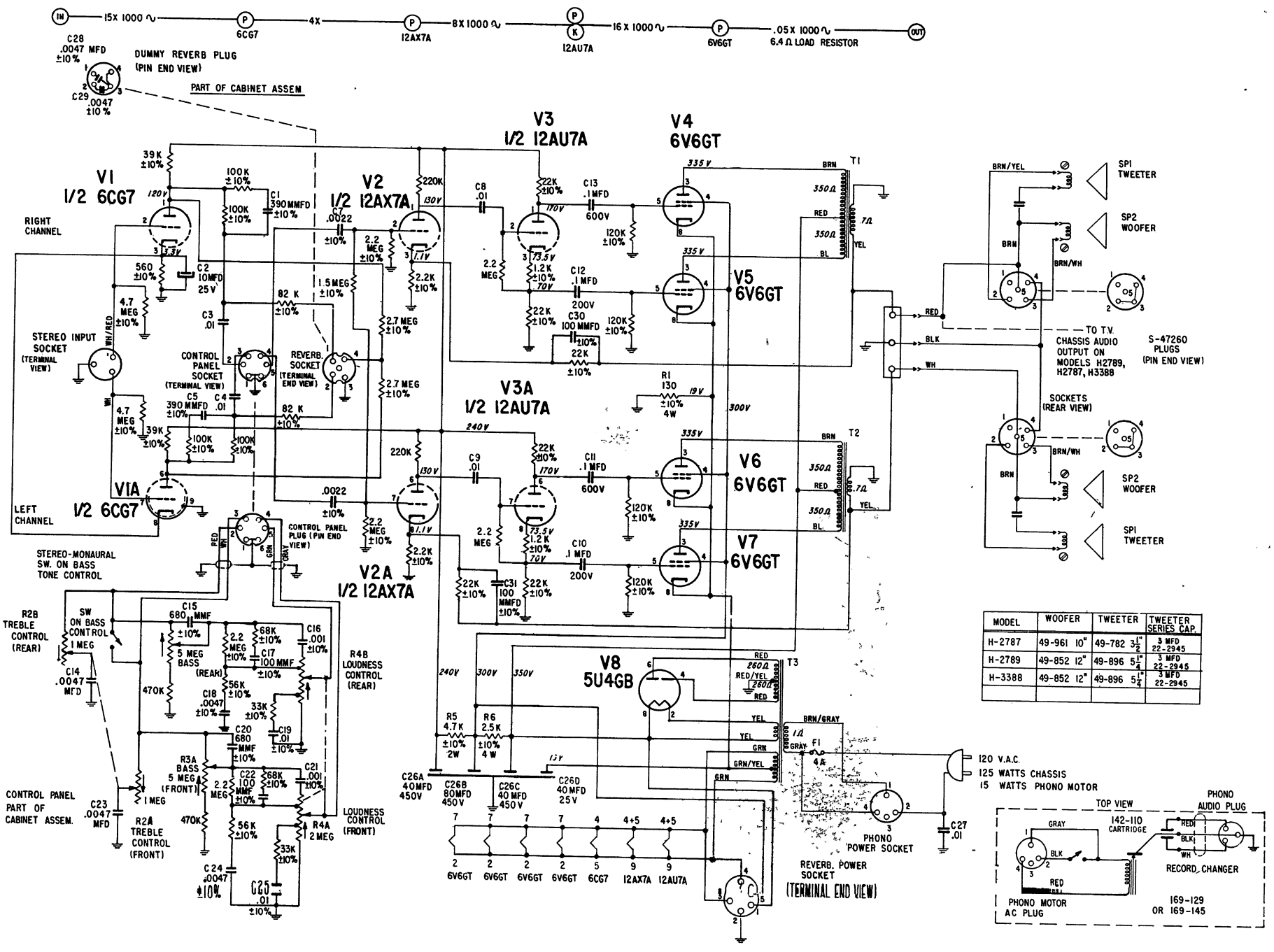
ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIES.

ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

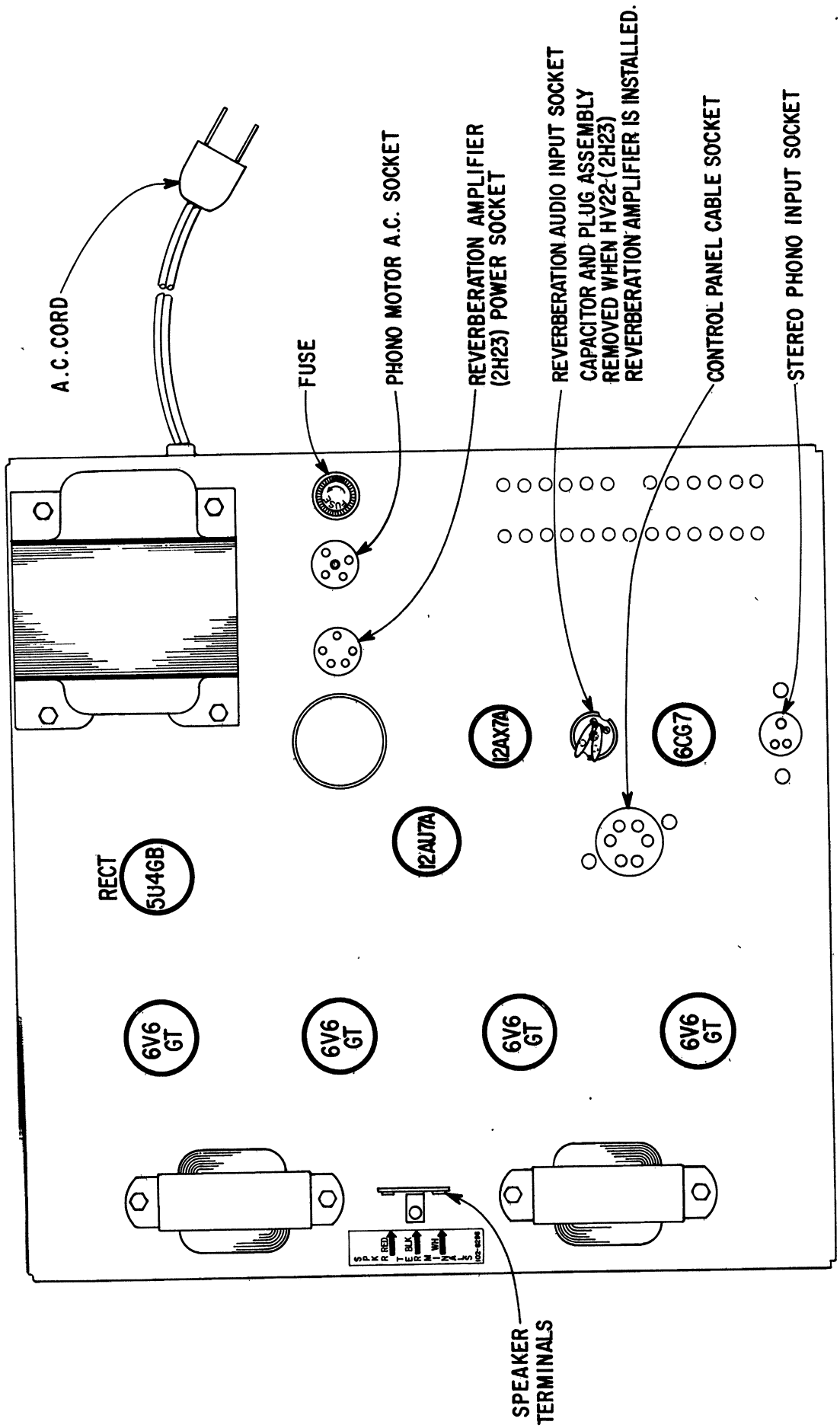
ALL VOLTAGES ARE MEASURED WITH POINTS INDICATED TO CHASSIS WITH AN A.C.-D.C. VACUUM TUBE VOLTMETER.

*SHORTING PLUGS MUST BE INSERTED IN SOCKETS WHEN REVERBERATION PRE AMP IS NOT USED.

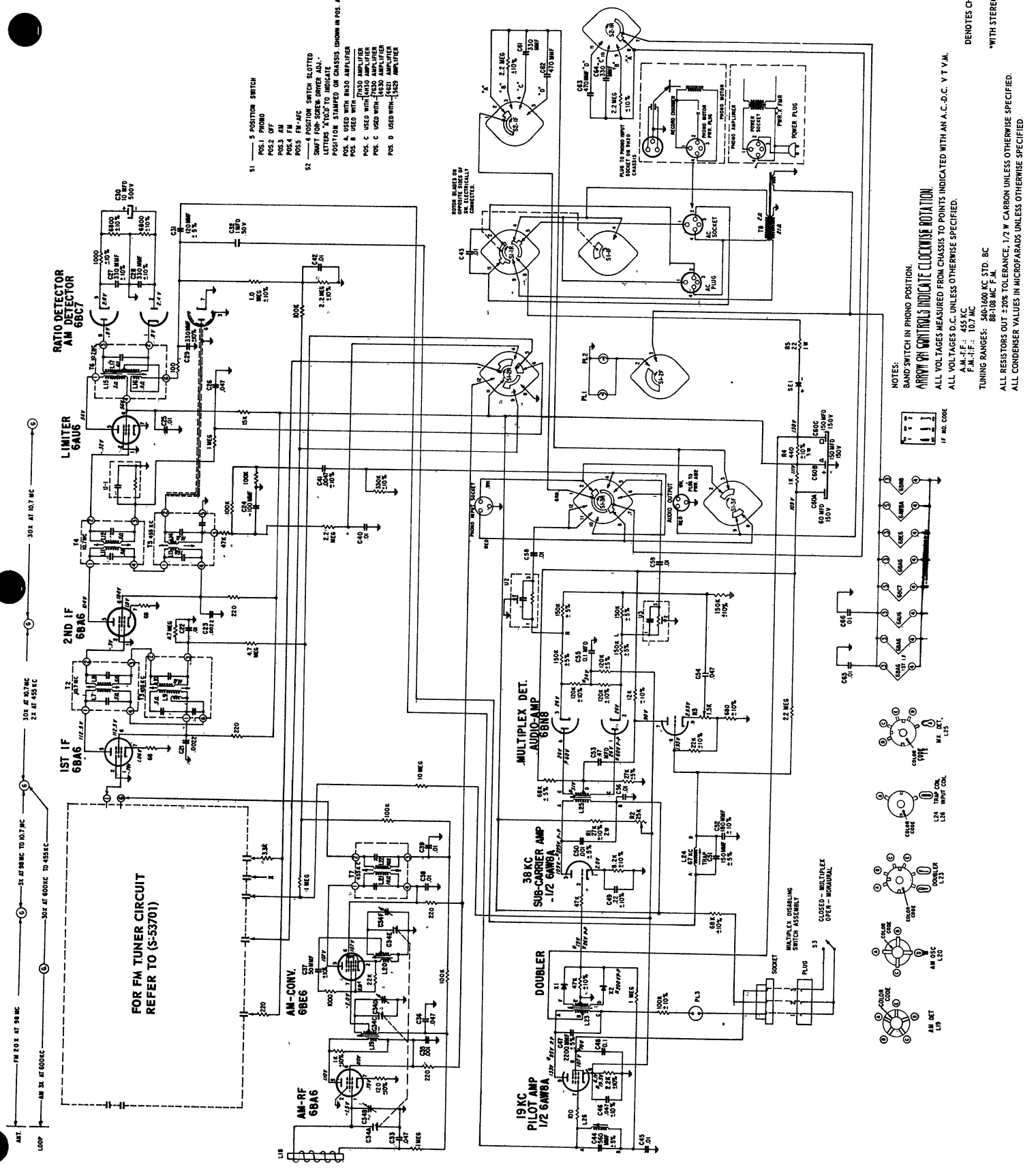
DENOTES CHASSIS



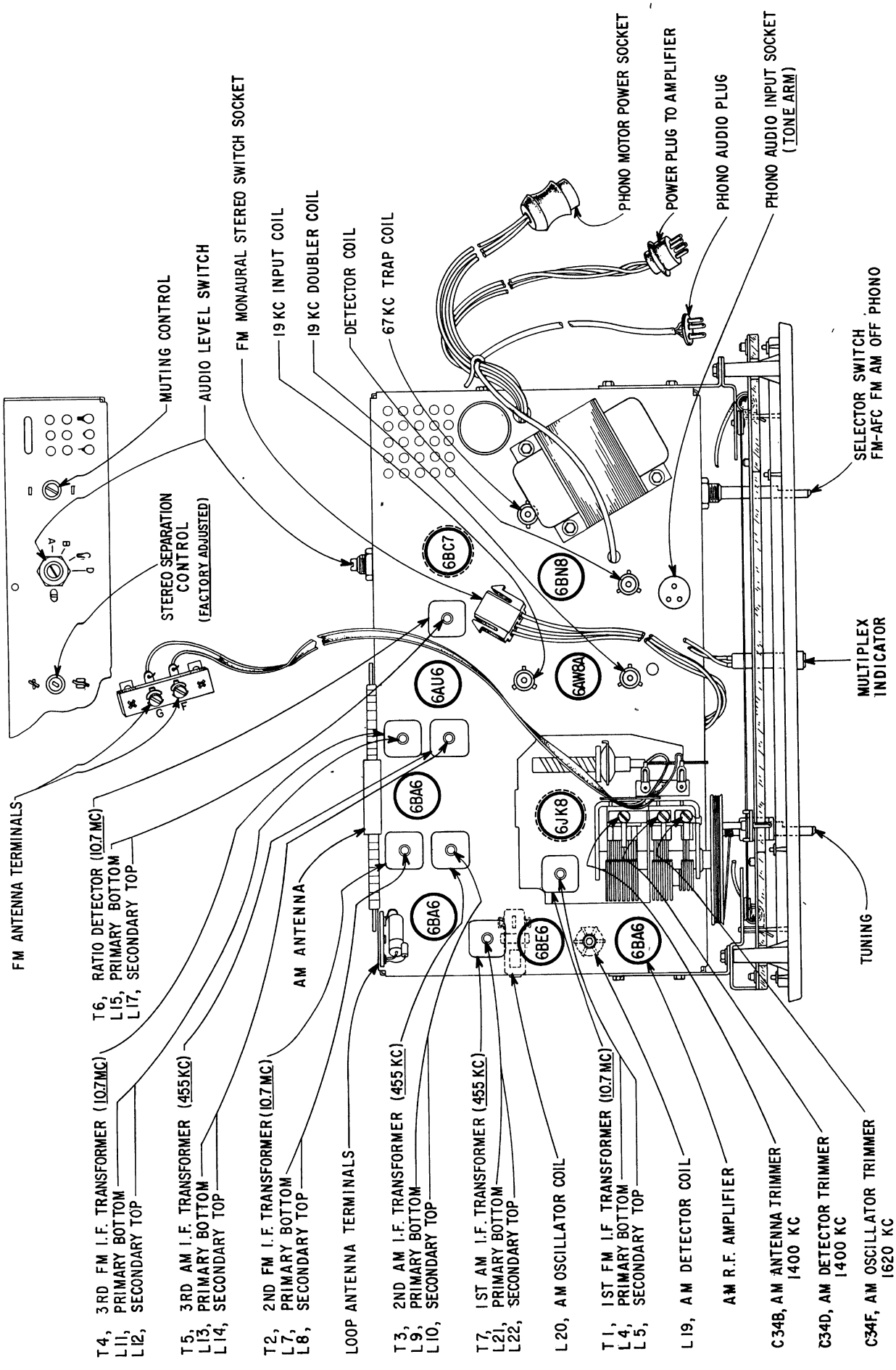
MODEL	WOOFER	TWEETER	TWEETER SERIES CAP.
H-2787	49-961 10"	49-782 3½"	3 MFD 22-2945
H-2789	49-852 12"	49-896 5¼"	3 MFD 22-2945
H-3388	49-852 12"	49-896 5¼"	3 MFD 22-2945



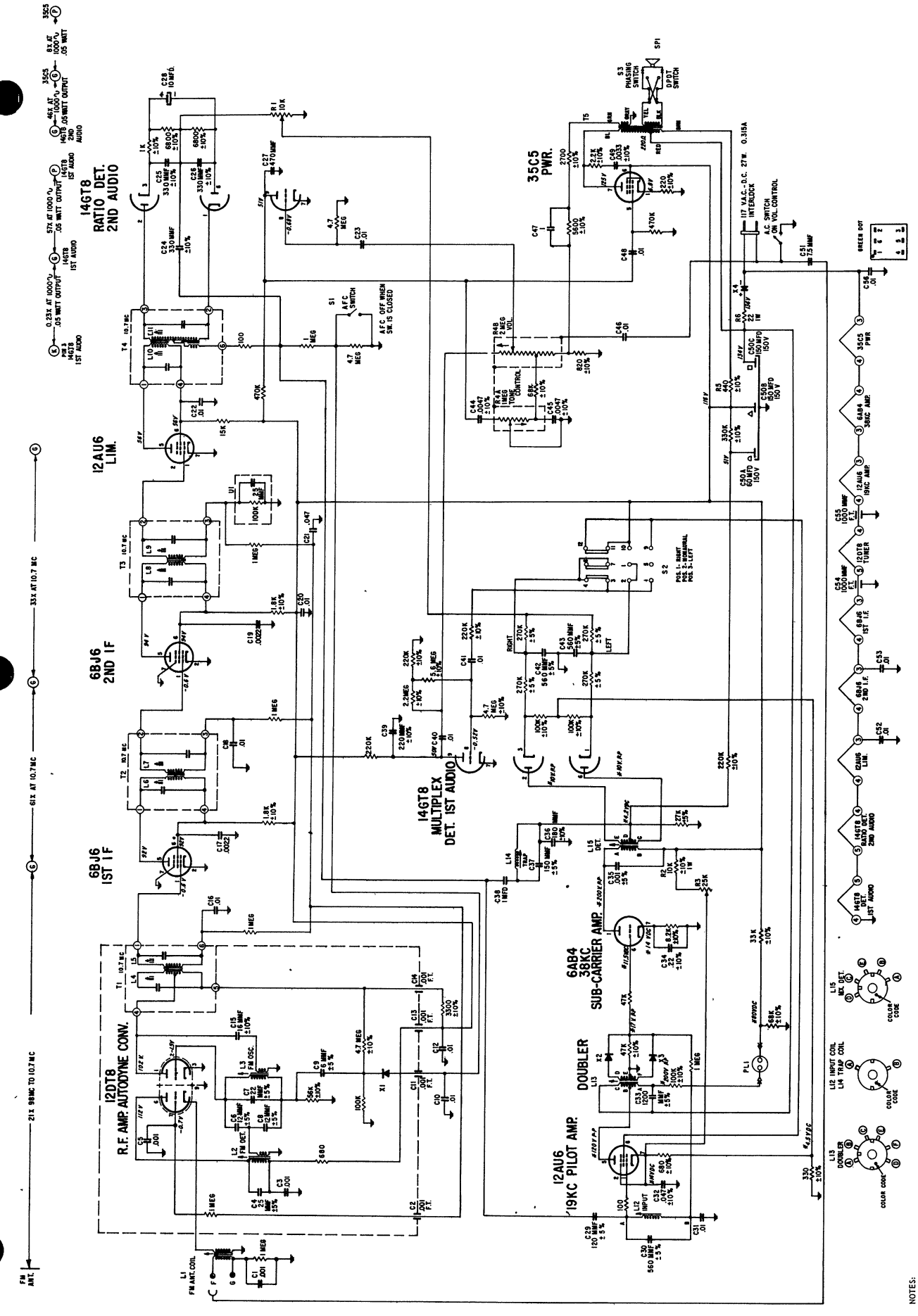
8H30 TUBE LAYOUT FOR MODELS H2787, H2789, H3388, MH2787, MH2789 & MH3388



9H20 SCHEMATIC FOR MHT15 TUNER APPLICABLE TO MODELS SFH2502T, MH2602, SFH2503T, MH2603, SFH2504T, MH2604, SFH2505T, MH2605, MH2607, SFH2515T, MH2615, MH2786, MH2787, MH2789 & MH3388

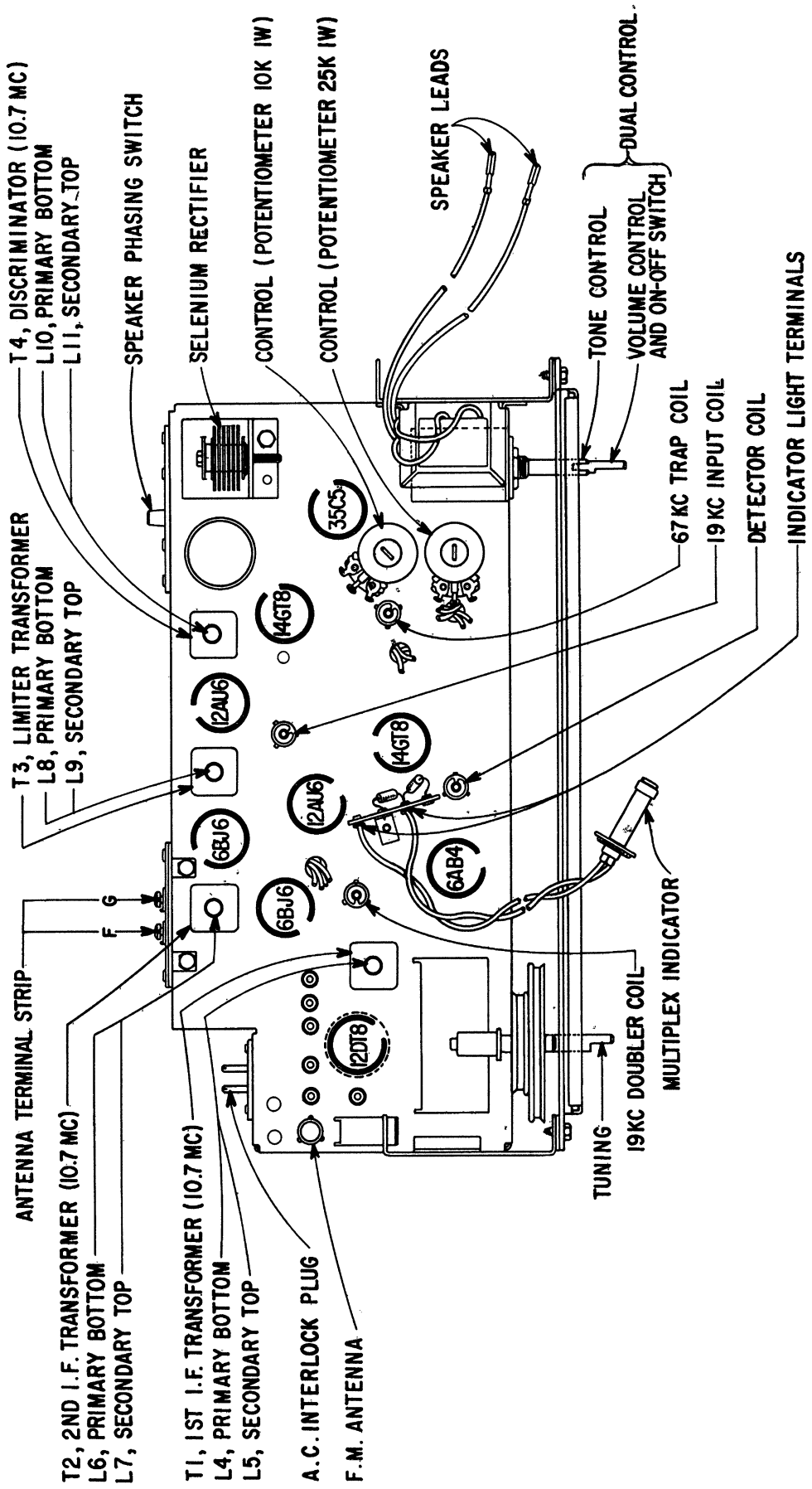


9H20 TUBE LAYOUT FOR MHT15 TUNER APPLICABLE TO MODELS SFH2502T, MH2602, SFH2503T, MH2603, SFH2504T, MH2604, SFH2505T, MH2605, MH2607, SFH2515T, MH2615, MH2786, MH2787, MH2789 & MH3388

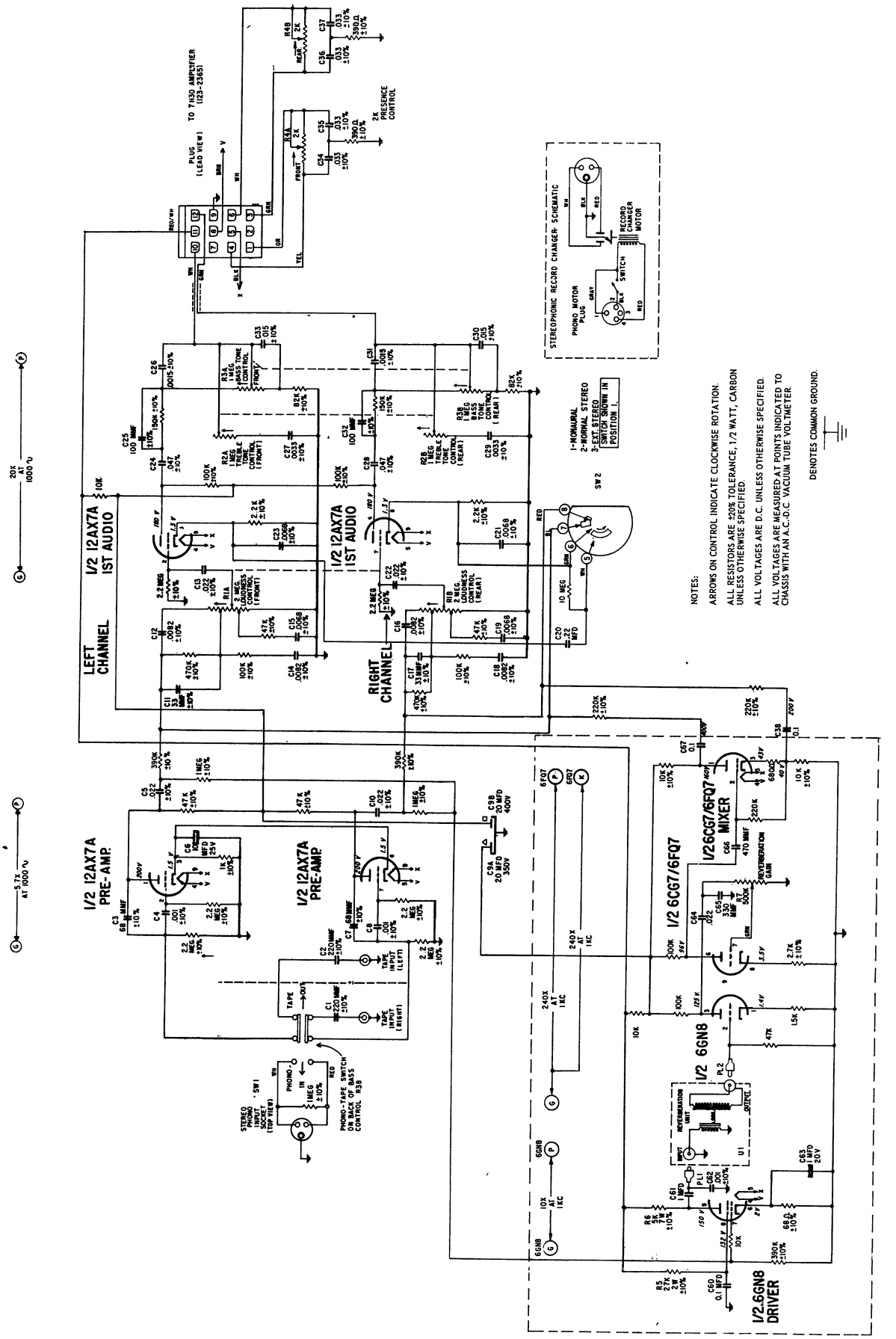


NOTES:
TUNING RANGES: 88 108 MC. FM
FM I.F 10.7 MC.
ALL VOLTAGES MEASURED FROM COMMON RETURNED TO POINTS INDICATED WITH A V.T.V.M. AND ARE D.C. UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE ±20% TOL., 1/2 WATT CARBON. UNLESS OTHERWISE SPECIFIED
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
* PRESENT ONLY WITH STEREO SIGNAL
DENOTES CHASSIS

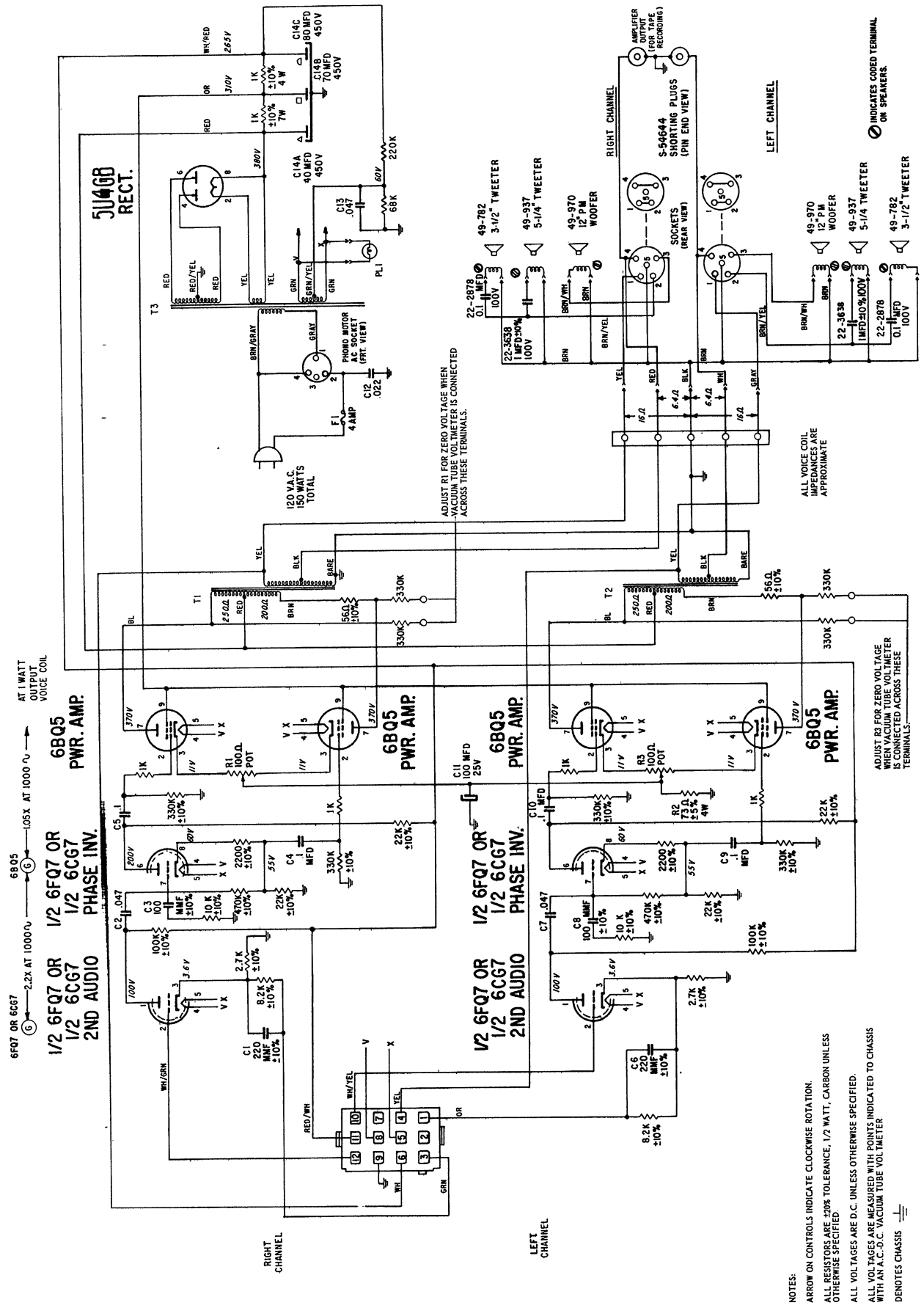
9H22 SCHEMATIC FOR MH910 MULTIPLEXER



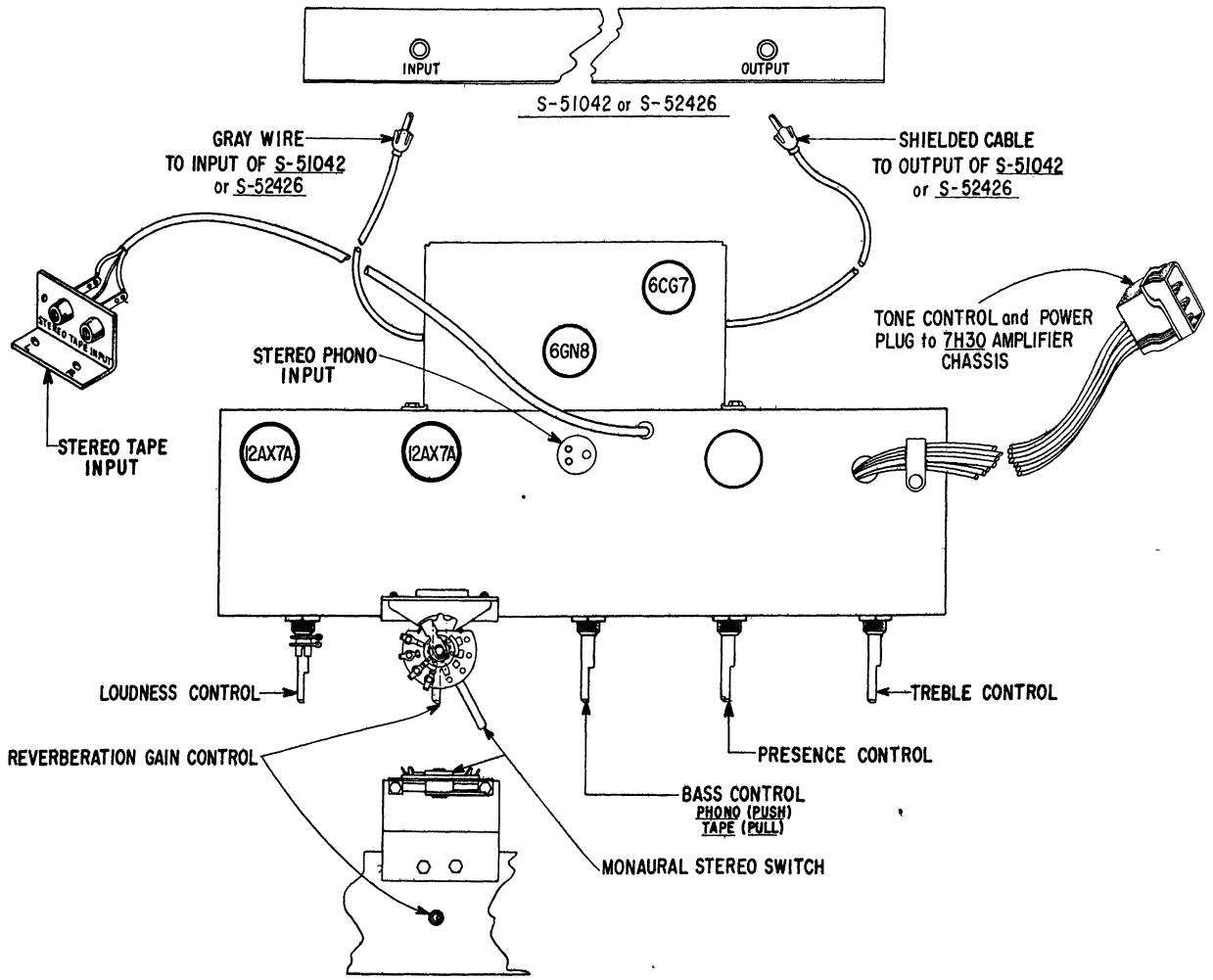
9H22 TUBE LAYOUT FOR MH910 MULTIPLEXER



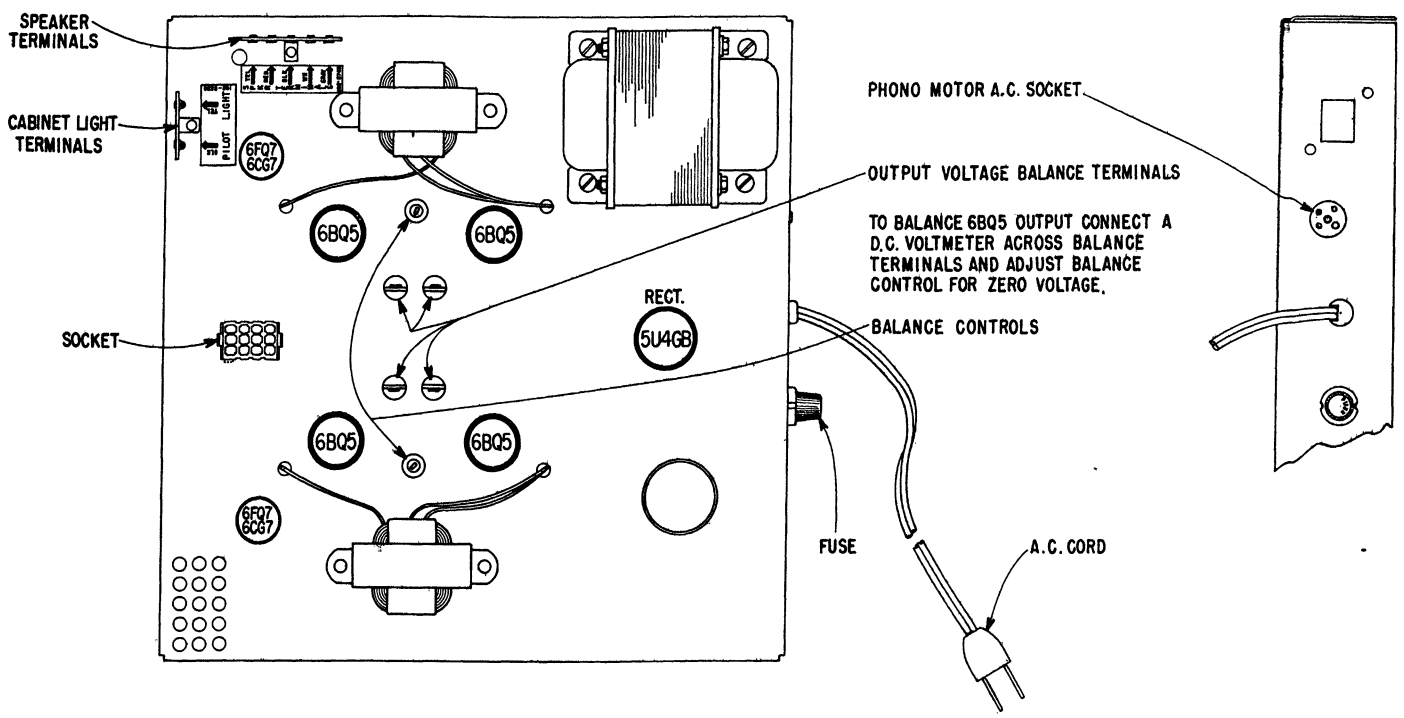
4H30 SCHEMATIC FOR MODELS SFH2515T & MH2615



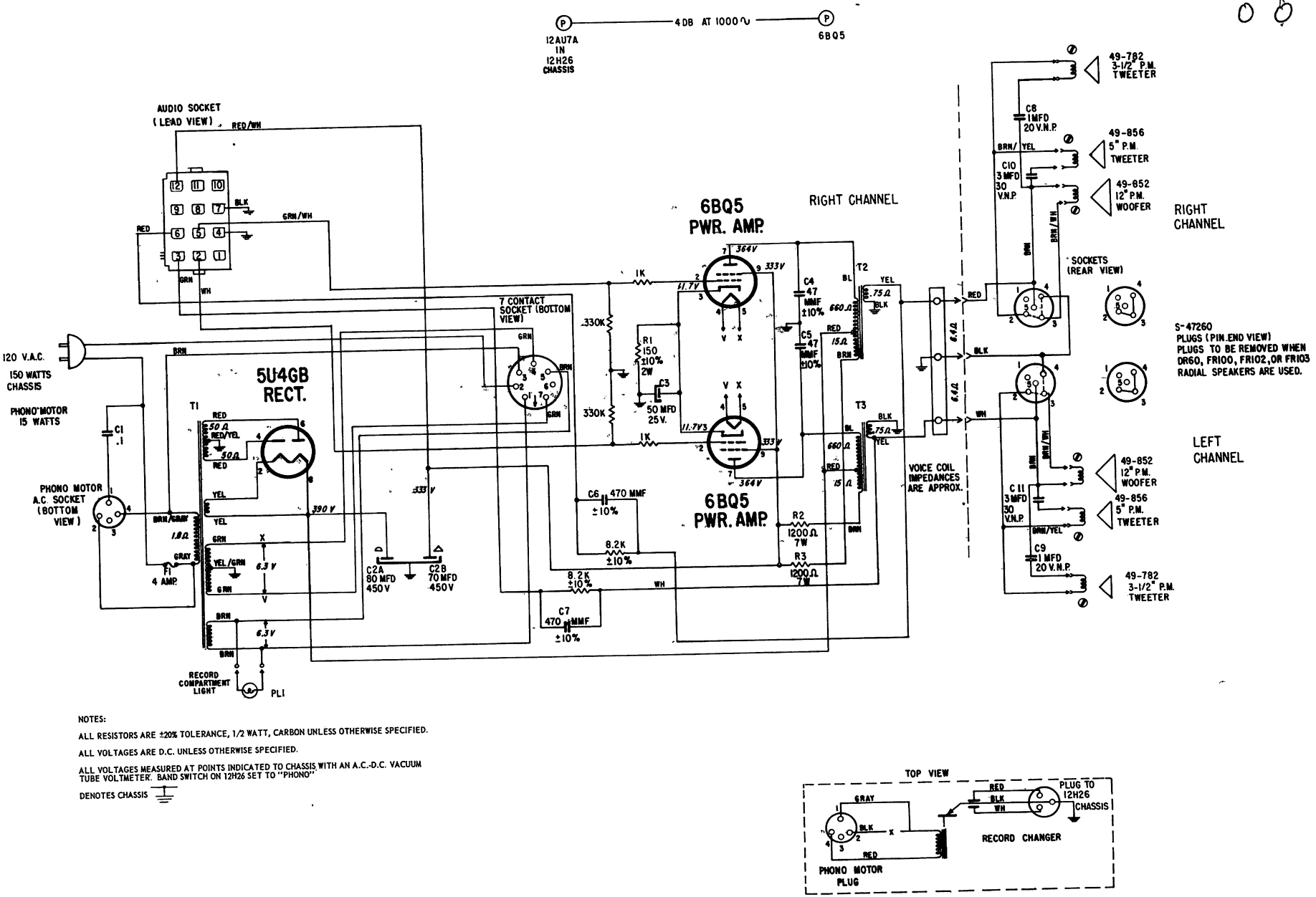
7H30 SCHEMATIC FOR MODELS SFH2515T & MH2615



4H30 TUBE LAYOUT FOR MODELS SFH2515T & MH2615



7H30 TUBE LAYOUT FOR MODELS SFH2515T & MH2615



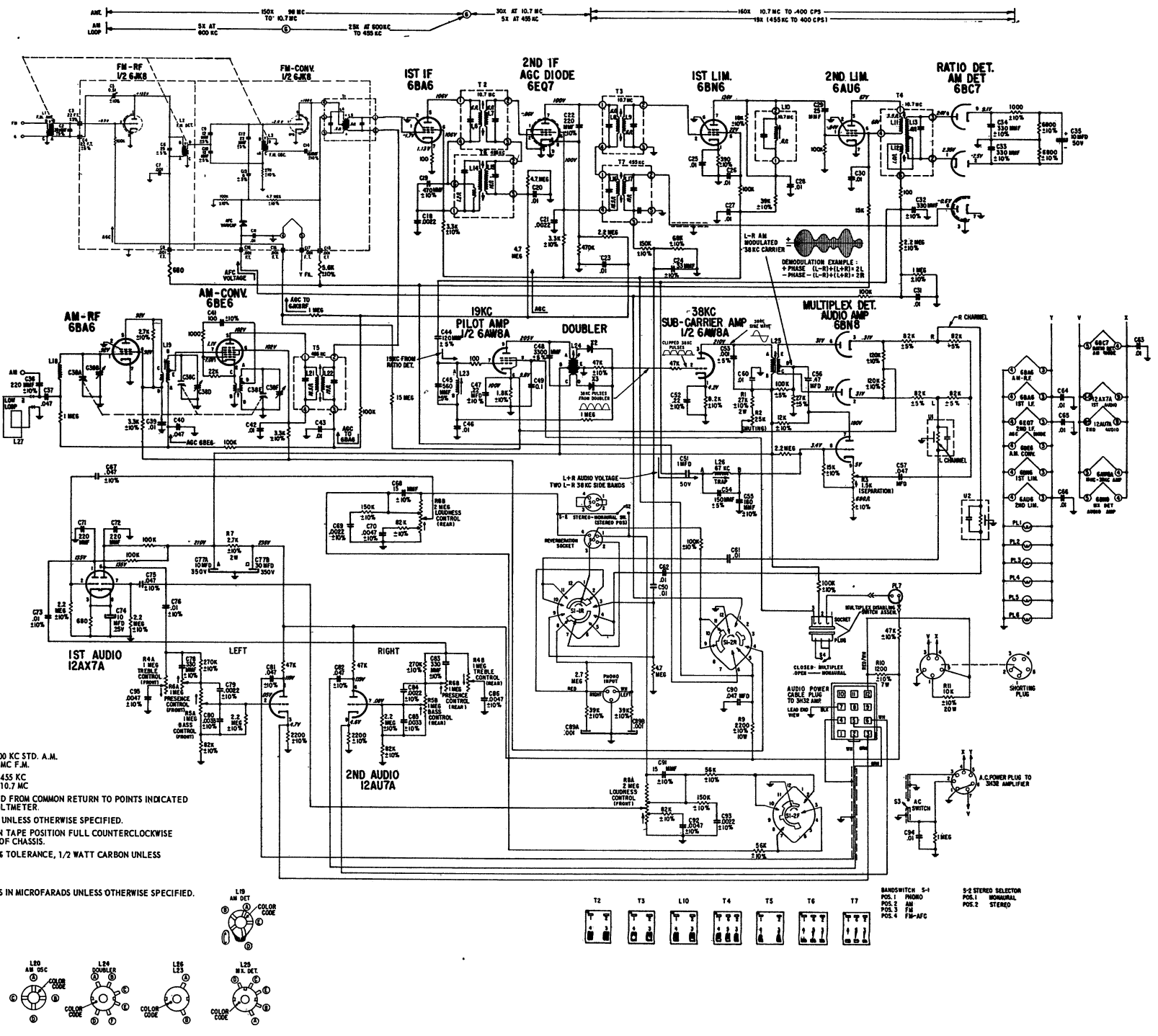
NOTES:

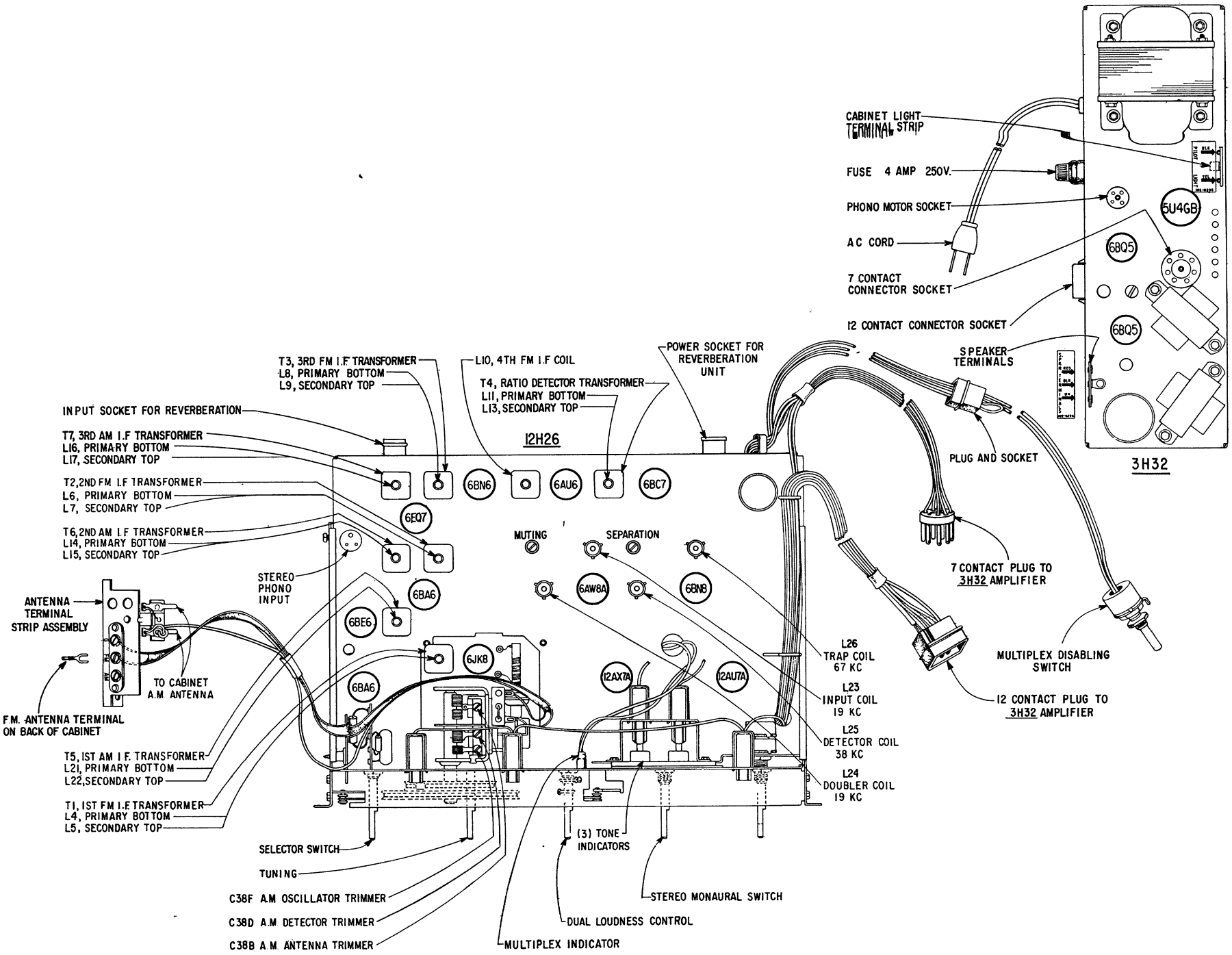
ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED.

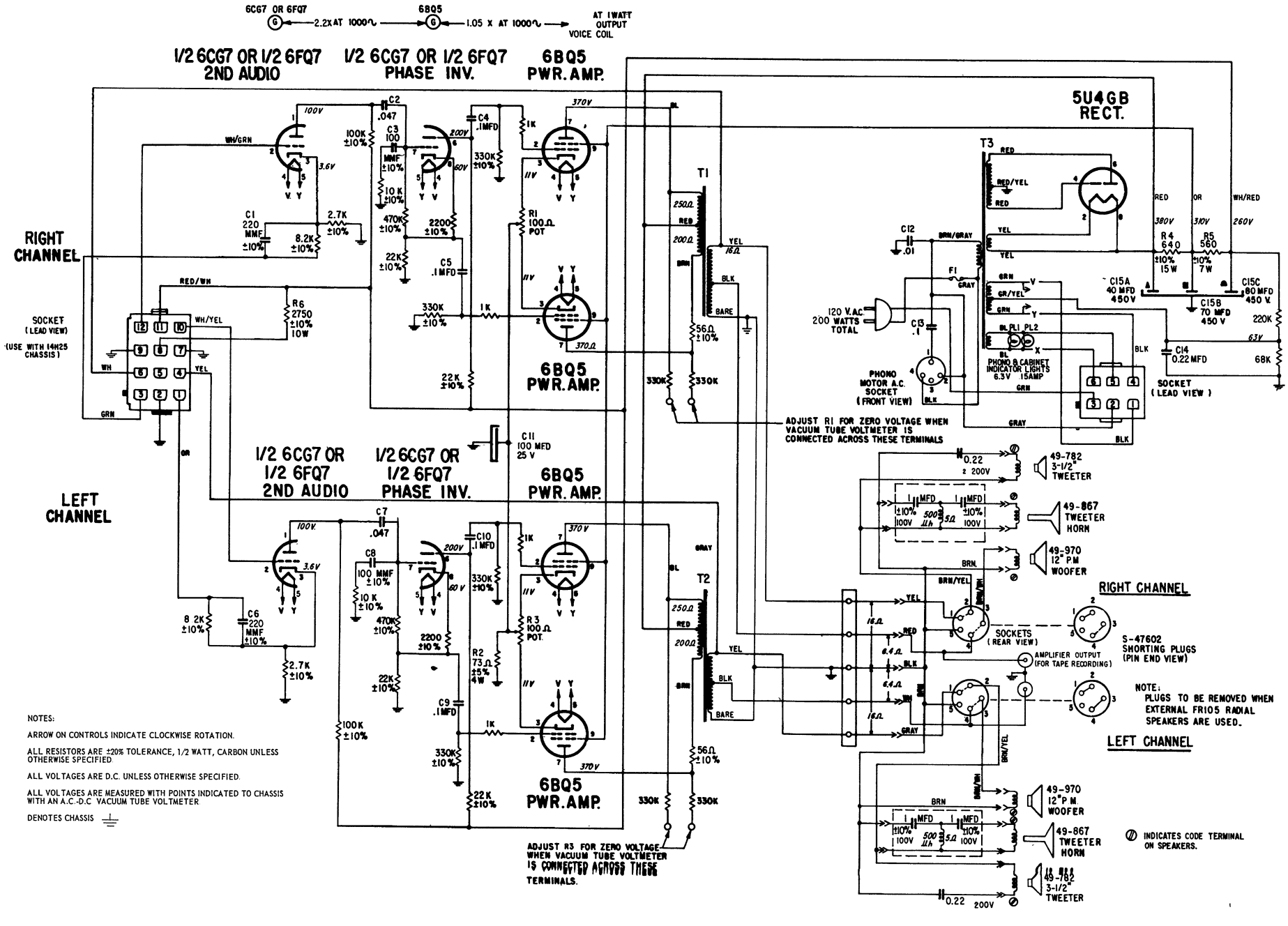
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.

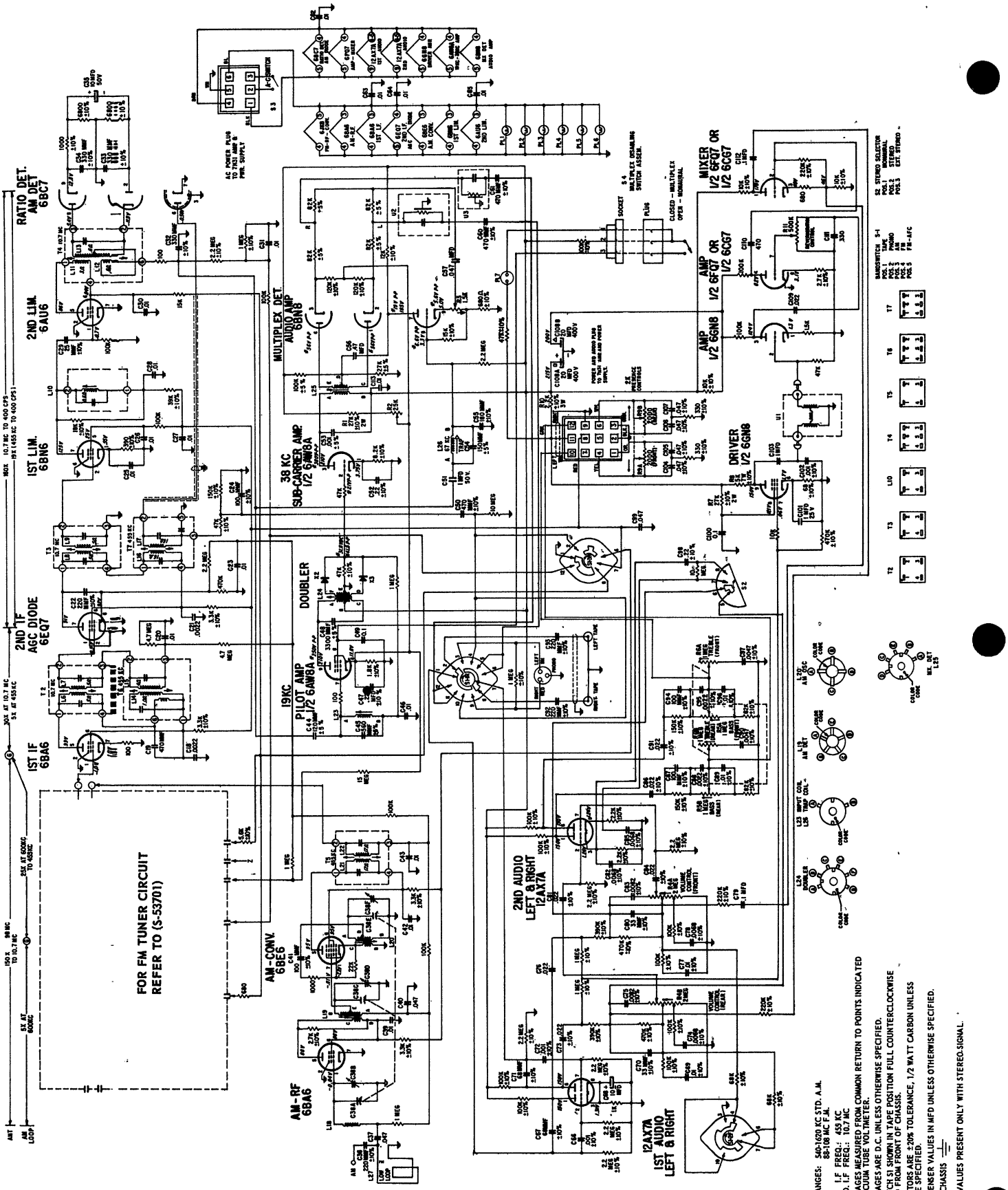
ALL VOLTAGES MEASURED AT POINTS INDICATED TO CHASSIS WITH AN A.C.-D.C. VACUUM TUBE VOLTMETER. BAND SWITCH ON 12H26 SET TO "PHONO"

DENOTES CHASSIS ⏚

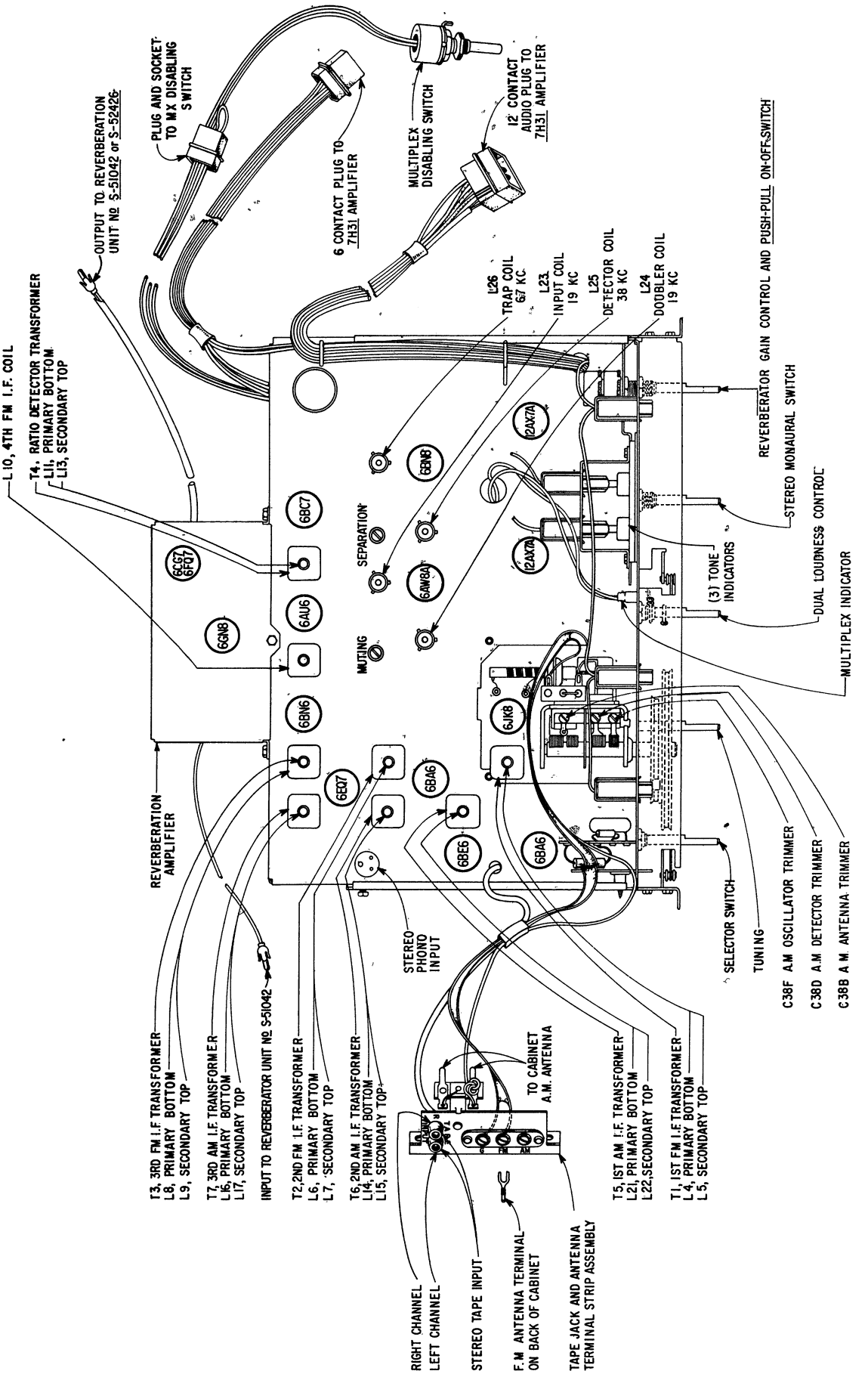

FM-RF 1/2 6JK8
FM-CONV. 1/2 6JK8
IST IF 6BA6
2ND IF AGC DIODE 6EQ7
IST LIM. 6BN6
2ND. LIM. 6AU6
RATIO DET. AM DET 6BC7
AM-CONV. 6BE6
AM-RF 6BA6
19KC PILOT AMP 1/2 6AW8A
DOUBLER
38KC SUB-CARRIER AMP 1/2 6AW8A
MULTIPLEX DET. AUDIO AMP 6BN8
1ST AUDIO 12AX7A
2ND AUDIO 12AU7A
LEFT
RIGHT
L-R AM MODULATED 38 KC CARRIER
DEMODULATION EXAMPLE :
+ PHASE (L-R)+(L+R)= 2L
- PHASE - (L-R)+(L+R)= 2R
L+R AUDIO VOLTAGE TWO L-R 38 KC SIDE BANDS
R CHANNEL
L CHANNEL
MULTIPLEX DISABLING SWITCH ASSEM.
SHORTING PLUG
AUDIO POWER CABLE PLUG TO 3H32 AMP
A.C. POWER PLUG TO 3H32 AMPLIFIER
A.C. SWITCH
REVERBERATION SOCKET
TUNING RANGES: 540-1600 KC STD. A.M.
88-108 MC F.M.
AMP. MOD. I.F FREQ.: 455 KC
FREQ. MOD. I.F FREQ.: 10.7 MC
ALL VOLTAGES MEASURED FROM COMMON RETURN TO POINTS INDICATED WITH A VACUUM TUBE VOLTMETER.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
BAND SWITCH S1 SHOWN IN TAPE POSITION FULL COUNTERCLOCKWISE AS VIEWED FROM FRONT OF CHASSIS.
ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT CARBON UNLESS OTHERWISE SPECIFIED.
DENOTES CHASSIS
ALL CAPACITORS VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
BANDSWITCH S-1
POS. 1 PHONO
POS. 2 AM
POS. 3 FM
POS. 4 FM-AFC
S-2 STEREO SELECTOR
POS. 1 MONAURAL
POS. 2 STEREO


CABINET LIGHT TERMINAL STRIP
FUSE 4 AMP 250V.
PHONO MOTOR SOCKET
AC CORD
7 CONTACT CONNECTOR SOCKET
12 CONTACT CONNECTOR SOCKET
5U4GB
6BQ5
6BQ5
3H32
SPEAKER TERMINALS
PLUG AND SOCKET
7 CONTACT PLUG TO 3H32 AMPLIFIER
MULTIPLEX DISABLING SWITCH
12 CONTACT PLUG TO 3H32 AMPLIFIER
POWER SOCKET FOR REVERBERATION UNIT
T3, 3RD FM I.F TRANSFORMER
L8, PRIMARY BOTTOM
L9, SECONDARY TOP
L10, 4TH FM I.F COIL
T4, RATIO DETECTOR TRANSFORMER
L11, PRIMARY BOTTOM
L13, SECONDARY TOP
12H26
INPUT SOCKET FOR REVERBERATION
T7, 3RD AM I.F TRANSFORMER
L16, PRIMARY BOTTOM
L17, SECONDARY TOP
T2, 2ND FM I.F TRANSFORMER
L6, PRIMARY BOTTOM
L7, SECONDARY TOP
T6, 2ND AM I.F TRANSFORMER
L14, PRIMARY BOTTOM
L15, SECONDARY TOP
6BN6
6AU6
6BC7
6EQ7
6BA6
6BE6
6JK8
6BA6
6AW8A
6BN8
12AX7A
12AU7A
MUTING
SEPARATION
STEREO PHONO INPUT
ANTENNA TERMINAL STRIP ASSEMBLY
TO CABINET A.M ANTENNA
FM. ANTENNA TERMINAL ON BACK OF CABINET
T5, 1ST AM I.F. TRANSFORMER
L21, PRIMARY BOTTOM
L22, SECONDARY TOP
T1, 1ST FM I.F TRANSFORMER
L4, PRIMARY BOTTOM
L5, SECONDARY TOP
L26 TRAP COIL 67 KC
L23 INPUT COIL 19 KC
L25 DETECTOR COIL 38 KC
L24 DOUBLER COIL 19 KC
SELECTOR SWITCH
TUNING
C38F A.M OSCILLATOR TRIMMER
C38D A.M DETECTOR TRIMMER
C38B A.M. ANTENNA TRIMMER
(3) TONE INDICATORS
MULTIPLEX INDICATOR
DUAL LOUDNESS CONTROL
STEREO MONAURAL SWITCH

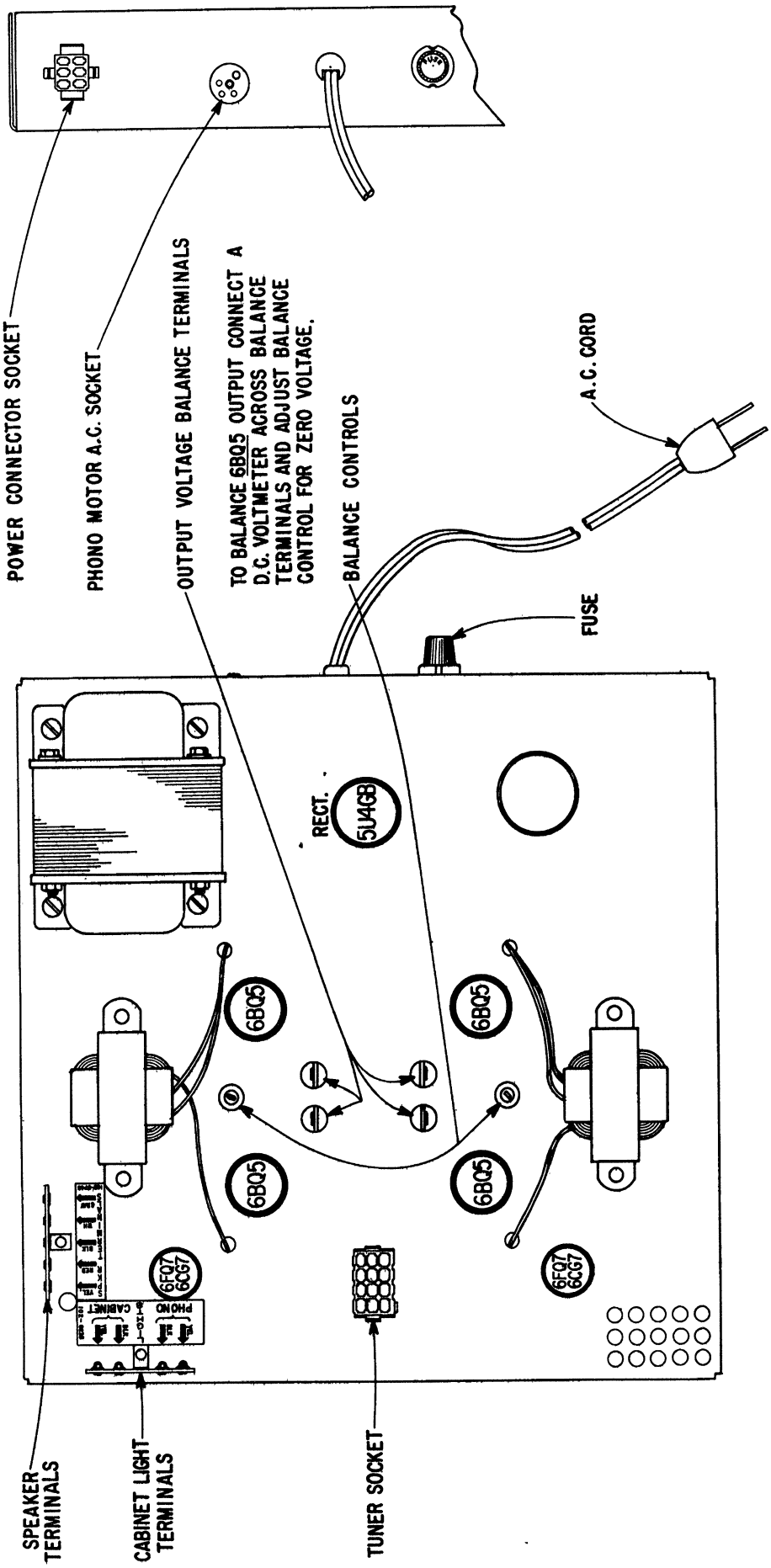

6CG7 OR 6FQ7
2.2X AT 1000Ω
6BQ5
1.05 X AT 1000Ω
AT 1 WATT OUTPUT VOICE COIL
1/2 6CG7 OR 1/2 6FQ7 2ND AUDIO
1/2 6CG7 OR 1/2 6FQ7 PHASE INV.
6BQ5 PWR. AMP.
5U4GB RECT.
RIGHT CHANNEL
LEFT CHANNEL
SOCKET (LEAD VIEW) (USE WITH 14H25 CHASSIS)
120 V.A.C. 200 WATTS TOTAL
PHONO MOTOR A.C. SOCKET (FRONT VIEW)
PHONO & CABINET INDICATOR LIGHTS 6.3V .15AMP
SOCKET (LEAD VIEW)
ADJUST R1 FOR ZERO VOLTAGE WHEN VACUUM TUBE VOLTMETER IS CONNECTED ACROSS THESE TERMINALS
ADJUST R3 FOR ZERO VOLTAGE WHEN VACUUM TUBE VOLTMETER IS CONNECTED ACROSS THESE TERMINALS.
49-782 3-1/2" TWEETER
49-867 TWEETER HORN
49-970 12" P.M. WOOFER
SOCKETS (REAR VIEW)
AMPLIFIER OUTPUT (FOR TAPE RECORDING)
S-47602 SHORTING PLUGS (PIN END VIEW)
NOTE: PLUGS TO BE REMOVED WHEN EXTERNAL FR105 RADIAL SPEAKERS ARE USED.
INDICATES CODE TERMINAL ON SPEAKERS.
NOTES:
ARROW ON CONTROLS INDICATE CLOCKWISE ROTATION.
ALL RESISTORS ARE ±20% TOLERANCE, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL VOLTAGES ARE MEASURED WITH POINTS INDICATED TO CHASSIS WITH AN A.C.-D.C VACUUM TUBE VOLTMETER.
DENOTES CHASSIS



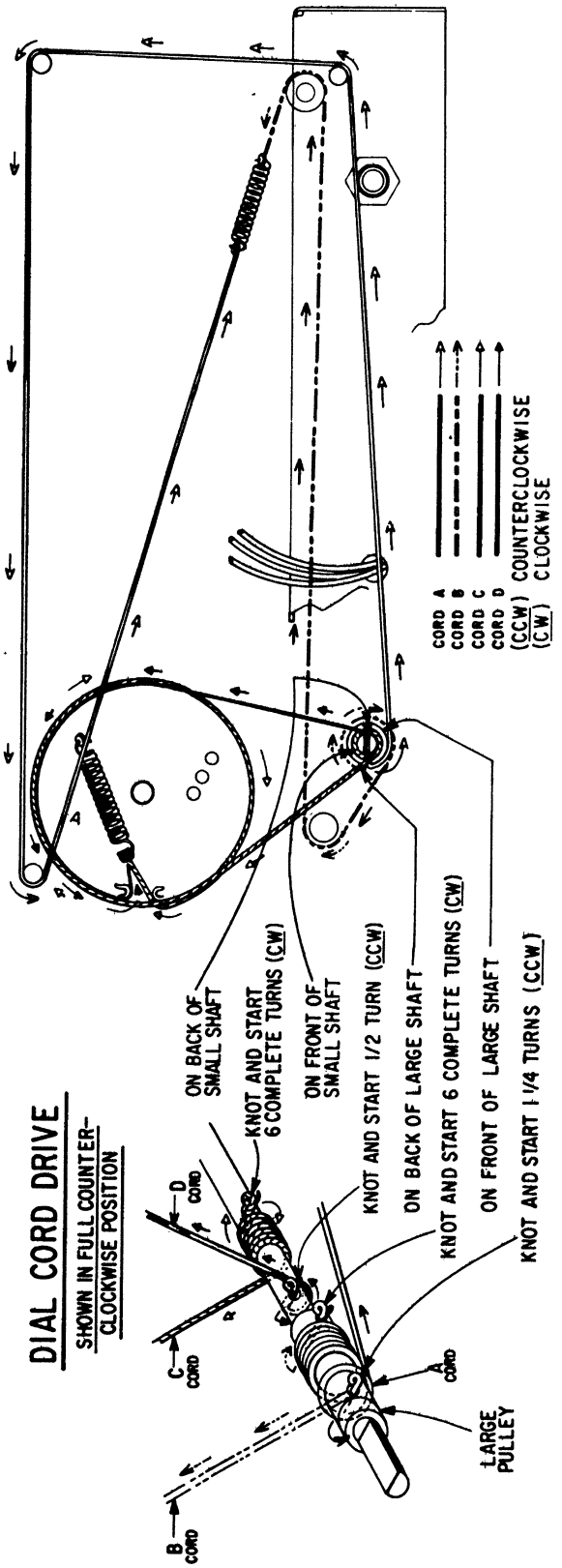
14H25 SCHEMATIC FOR MODELS MH2670, MH2675 & MH2685



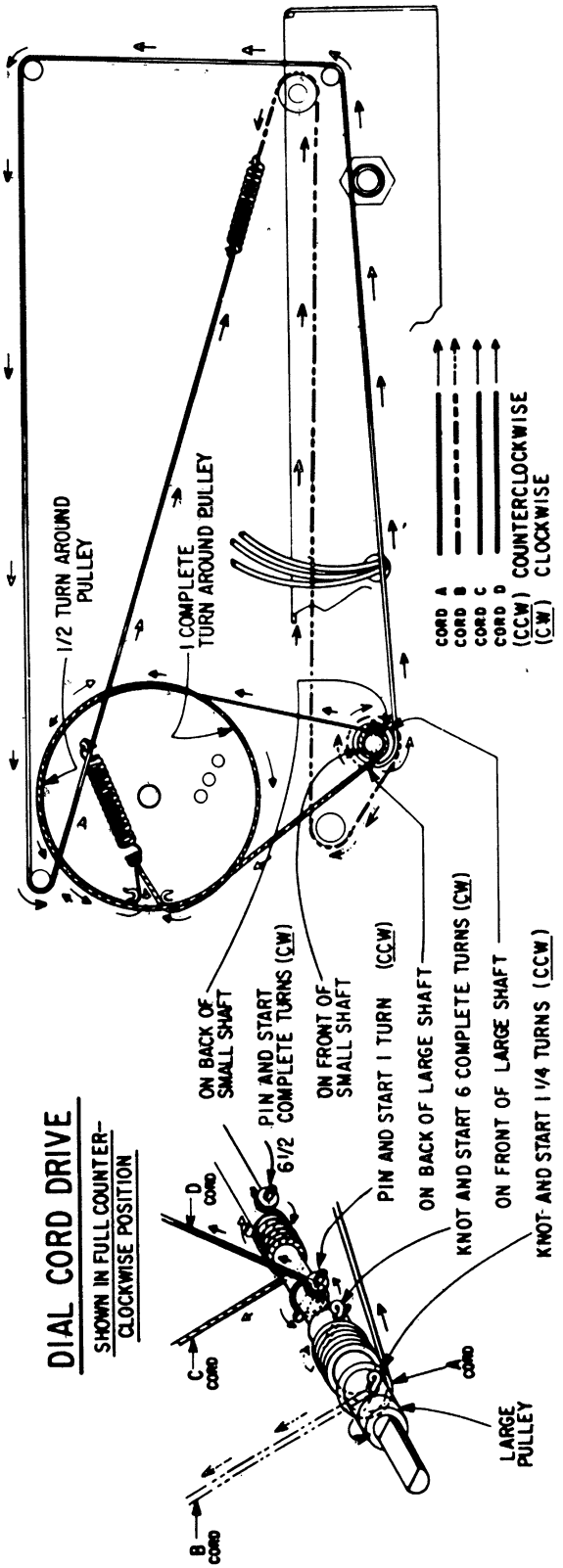
14H25 TUBE LAYOUT FOR MODELS MH2670, MH2675 & MH2685



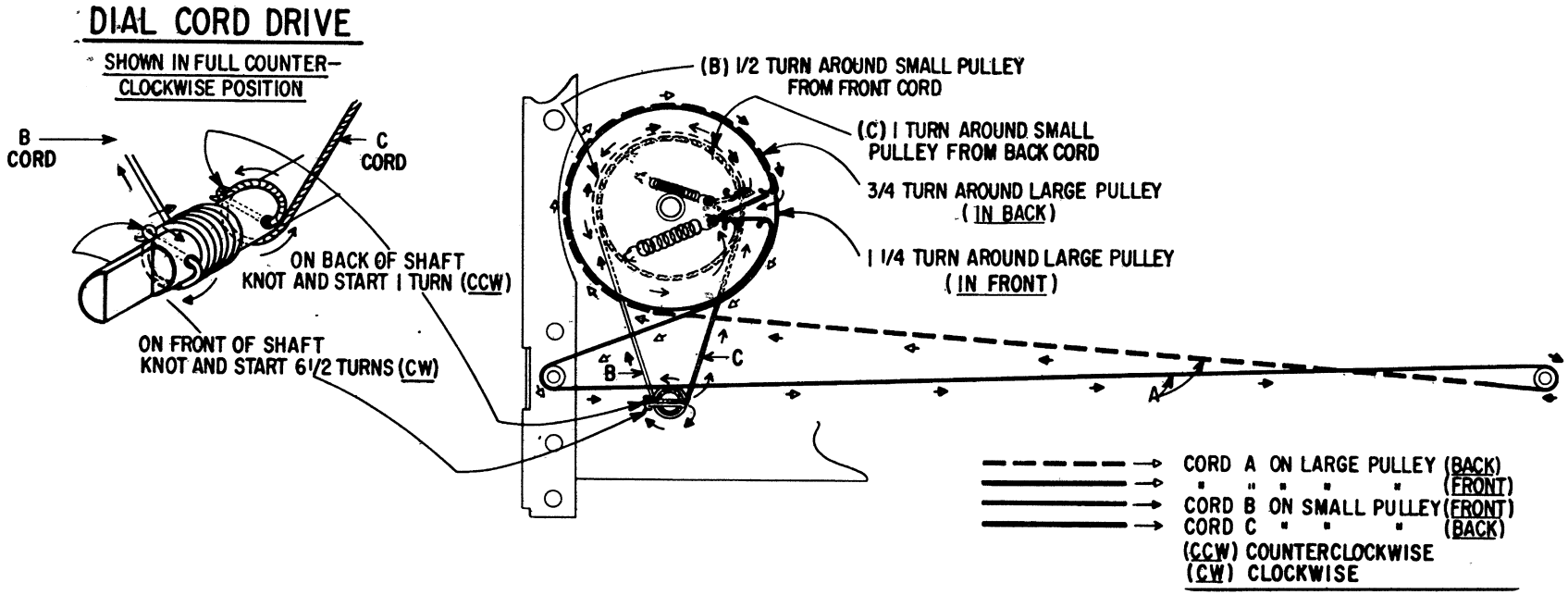
7H31 TUBE LAYOUT FOR MODELS MH2670, MH2675 & MH2685



DIAL CORD DRIVE FOR MHT15 CHASSIS 9H20

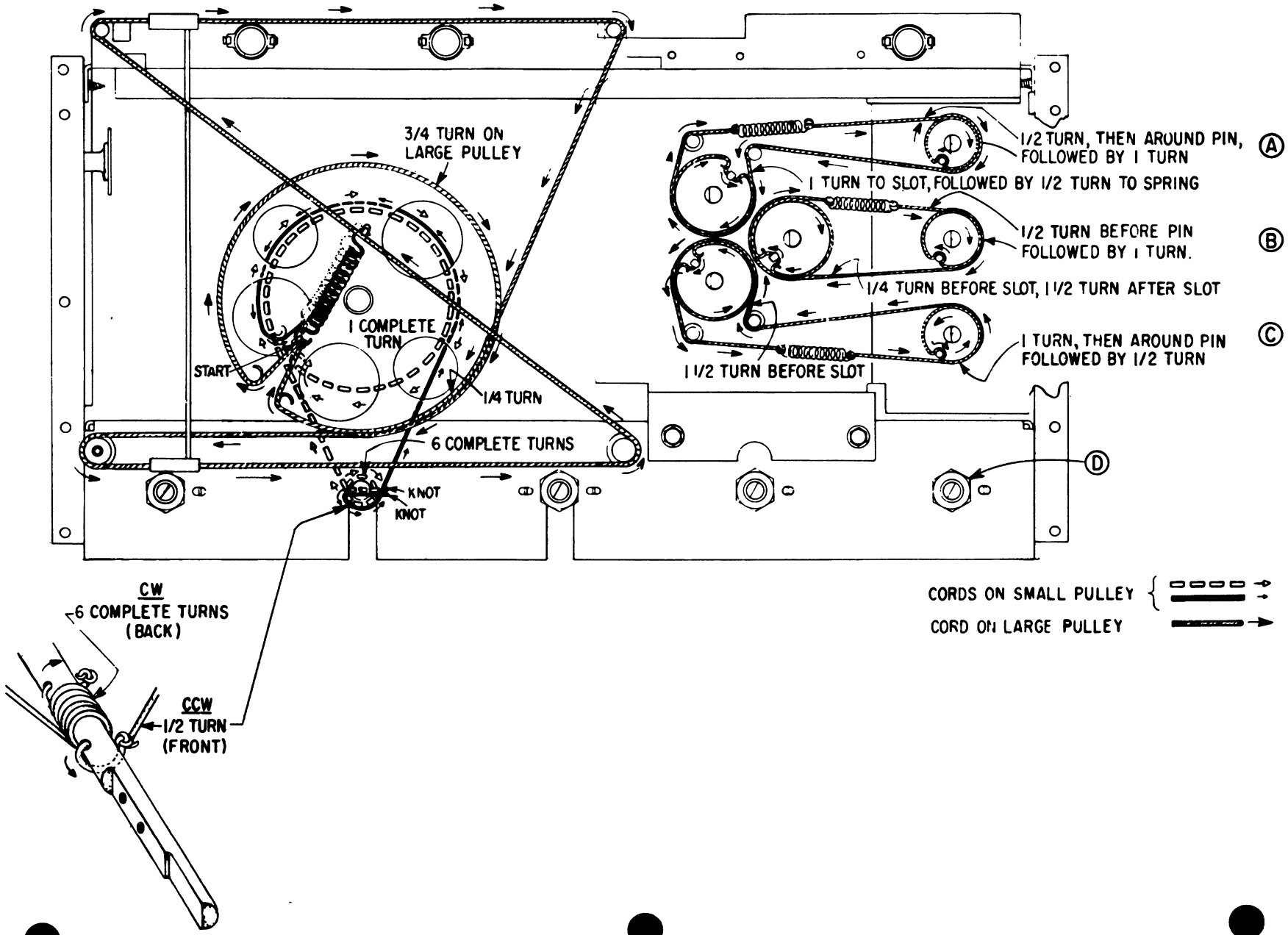


DIAL CORD DRIVE FOR MHT14 CHASSIS 9H21


DIAL CORD DRIVE
SHOWN IN FULL COUNTER-CLOCKWISE POSITION
B CORD
C CORD
ON BACK OF SHAFT KNOT AND START 1 TURN (CCW)
ON FRONT OF SHAFT KNOT AND START 6 1/2 TURNS (CW)
(B) 1/2 TURN AROUND SMALL PULLEY FROM FRONT CORD
(C) 1 TURN AROUND SMALL PULLEY FROM BACK CORD
3/4 TURN AROUND LARGE PULLEY (IN BACK)
1 1/4 TURN AROUND LARGE PULLEY (IN FRONT)
A
B
C
CORD A ON LARGE PULLEY (BACK)
(FRONT)
CORD B ON SMALL PULLEY (FRONT)
CORD C (BACK)
(CCW) COUNTERCLOCKWISE
(CW) CLOCKWISE

DIAL CORD DRIVE

SHAFTS IN FULL COUNTERCLOCKWISE POSITION



NUMERICAL PARTS LIST

CHASSIS 2H23

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2340	.1	400 V
C2	22-3404	1 mfd	400 V
C3A	22-3486	40 mfd	450 V
C3B		10 mfd	350 V
C4	22-14	.0047	500 V
C5	22-18	.0022	500 V
C6	22-18	.0022	500 V
C7	22-14	.0047	500 V
C8	22-14	.0047	500 V
R1	63-3628	1800	4 W
R2	63-1620	1800	2 W
R3	63-1188	39 K	1 W
R4	63-4055	7.5 K	4 W
R5	63-4831	Reverberation Control	
U1	S-52426	Reverberator	
PL1	58-176	Power Plug	
PL2	58-226	Sound Plug	

CHASSIS 3H01

REF. NO.	PART NO.	DESCRIPTION	
C1	22-3327	30 mmf Disc Cap.	500 V
C2	22-17	.001 mfd Disc Cap.	500 V
C3	22-1775	.047 mfd	400 V
C4	22-3076	10 mfd Electro	25 V
C5	22-17	.001 mfd Disc Cap.	500 V
C6	22-3327	30 mmf Disc Cap.	500 V
C7	22-3	.01 mfd Disc Cap.	500 V
C8	22-13	.0033 mfd Disc Cap.	500 V
C9	22-3	.01 mfd Disc Cap.	500 V
C10	22-13	.0033 mfd Disc Cap.	500 V
C11	22-12	.0015 mfd Disc Cap.	500 V
C12	22-3241	100 mfd Electro	50 V
C13	22-12	.0015 mfd Disc Cap.	500 V
C14	22-2072	.022 mfd	400 V
C15	22-2072	.022 mfd	400 V
C16	22-2945	3 mfd N. P. Electro	30 V
C17	22-2945	3 mfd N. P. Electro	30 V
C18A	22-3559	20 mfd Electro	150 V
C18B		150 mfd Electro	150 V
C18C		150 mfd Electro	150 V
C19	22-1775	.047 mfd	400 V
C20	22-3	.01 mfd Disc Cap.	500 V
C21	22-3014	820 mmf Mica.	500 V
R1A	63-4840	Dual Loudness Control	
R1B			
R2A	63-4838	Dual Tone Control	
R2B			
R3	63-4839	Balance Control	
R4	63-4843	63 Ohm	4 W
R5	63-4890	10 Ohm	3 W
R6	63-4851	125 Ohm	4 W
SE1	212-33	250 MA Selenium Rectifier	
T1	95-1907	Output Transformer	
T2	95-1907	Output Transformer	

CHASSIS 3H32

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2061	.1 Mfd.	400 V
C2A		80 Mfd. Electrolytic	450 V
C2B	22-3625	70 Mfd. Electrolytic	450 V

CHASSIS 3H32 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C3	22-1561	50 Mfd. Electrolytic	25 V
C4	22-2376	47 Mmf.	500 V
C5	22-2376	47 Mmf.	500 V
C6	22-16	470 Mmf. Cer.	500 V
C7	22-16	470 Mmf. Cer.	500 V
C8	22-3374	1 Mfd. Electrolytic	20 Vac
C9	22-3374	1 Mfd. Electrolytic	20 Vac
C10	22-2945	3 Mfd. Electrolytic	30 Vac
C11	22-2945	3 Mfd. Electrolytic	30 Vac
R1	63-2019	150 Ohm	2 W
R2	63-4475	1200 Ohm	7 W
R3	63-4475	1200 Ohm	7 W
T1	95-1912	Power Transformer	
T2	95-1911	Output Transformer	
T3	95-1911	Output Transformer	
F1	136-31	4 Amp. Fuse	
PL1	100-249	Pilot Light 6 Volt-0.15 Amp. Type Number 1847	

CHASSIS 4G21

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2376	47 mmf Disc	500 V
C2	22-18	.0022 mfd Disc	500 V
C3	22-1842	.0047 mfd	200 V
C4	22-2302	470 mmf Disc	500 V
C5	22-2302	470 mmf Disc	500 V
C6	22-2376	47 mmf Disc	500 V
C7	22-18	.0022 mfd Disc	500 V
C8	22-1842	.0047 mfd	200 V
C9	22-14	.0047 mfd Disc	500 V
C10	22-14	.0047 mfd Disc	500 V
C11	22-3518	.047 mfd Disc	200 V
C12	22-1813	.022 mfd	600 V
C13	22-3	.01 mfd Disc	500 V
C14	22-2565	.01 mfd	200 V
C15	22-3	.01 mfd	500 V
C16	22-3518	.047 mfd	200 V
C17	22-1156	40 mfd Electro	25 V
C18	22-1813	.022 mfd	600 V
C19	22-2565	.01 mfd	200 V
C20	22-1779	.01 mfd	600 V
C21	22-2376	47 mmf Disc	500 V
C22	22-2376	47 mmf Disc	500 V
C23A		80 mfd Electrolytic	450 V
C23B	22-3245	40 mfd Electrolytic	450 V
C23C		20 mfd Electrolytic	350 V
R1A	63-4670	5 Megohm Bass Control (Front)	
R1B		5 Megohm Bass Control (Rear)	
R2A	63-4447	2 Megohm Loudness Control (Front)	
R2B		2 Megohm Loudness Control (Rear)	
R3A	63-4671	.5 Megohm Treble Control (Front)	
R3B		.5 Megohm Treble Control (Rear)	
R4	63-2019	150 Ohm	2 W
R5	63-3259	1750 Ohm	5 W
R6	63-4423	3.3 K	3 W
R7	63-4423	3.3 K	3 W
R8	63-3066	10 K	20 W
T1	95-1859	Output Transformer	
T2	95-1859	Output Transformer	
T3	95-1837	Power Transformer	
F1	136-31	4 Amp. Fuse	

CHASSIS 4H30

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2703	220 Mmf. Disc	
C2	22-2703	220 Mmf. Disc	
C3	22-3608	68 Mmf. Disc	
C4	22-17	.001 Mfd. Disc	1000 V
C5	22-2621	.022 Mfd.	400 V
C6	22-3076	10 Mfd. Electrolytic	25 V
C7	22-3608	68 Mmf. Disc	
C8	22-17	.001 Mfd. Disc	
C9A	22-3617	20 Mfd. Electrolytic	350 V
C9B		20 Mfd. Electrolytic	400 V
C10	22-262 1	.022 Mfd.	400 V
C11	22-286 3	33 Mmf. Disc	
C12	22-243 1	.0082 Mfd.	200 V
C13	22-178 1	.022 Mfd.	200 V
C14	22-243 1	.0082 Mfd.	200 V
C15	22-265 6	.0068 Mfd.	200 V
C16	22-243 1	.0082 Mfd.	200 V
C17	22-286-3	33 Mmf. Disc	
C18	22-243-1	.0082 Mfd.	200 V
C19	22-265-6	.0068 Mfd.	200 V
C20	22-2167	.22 Mfd.	200 V
C21	22-2704	.0068 Mfd. Disc	
C22	22-1781	.022 Mfd.	200 V
C23	22-2704	.0068 Mfd. Disc	
C24	22-2634	.047 Mfd.	400 V
C25	22-9	100 Mmfd. Disc	
C26	22-12	.0015 Mfd. Disc	
C27	22-13	.0033 Mfd. Disc	
C28	22-2634	.047 Mfd.	400 V
C29	22-13	.0033 Mfd. Disc	
C30	22-1850	.015 Mfd.	200 V
C31	22-12	.0015 Mfd. Disc	
C32	22-9	100 Mmfd. Disc	
C33	22-1850	.015 Mfd.	200 V
C34	22-2510	.033 Mfd.	200 V
C35	22-2510	.033 Mfd.	200 V
C36	22-2510	.033 Mfd.	200 V
C37	22-2510	.033 Mfd.	200 V
C38	22-1777	.1 Mfd.	200 V
C60	22-2340	.1 Mfd.	400 V
C61	22-3404	1 Mfd.	400 V
C62	22-17	.001 Mfd. Disc	1000 V
C63	22-3374	1 Mfd. Electrolytic	
C64	22-2072	.022 Mfd.	400 V
C65	22-3610	330 Mmfd. Disc	
C66	22-3	.01 Mfd. Disc	
C67	22-2061	.1 Mfd.	400 V
R1A	63-4877	2 Meg. Loudness Control (Front)	
R1B		2 Meg. Loudness Control (Rear)	
R2A	63-4891	1 Meg. Treble Control (Front)	
R2B		1 Meg. Treble Control (Rear)	
R3A	63-4892	1 Meg. Bass Control (Front)	
R3B		1 Meg. Bass Control (Rear)	
R4A	63-4875	2 K. Presence Control (Front)	
R4B		2 K. Presence Control (Rear)	
R5	63-4093	27 K. Ohm	2 W
R6	63-4882	5 K. Ohm	7 W
R7	63-4876	500 K. Reverb. Gain Control	
SW2	85-713	3 Pos. Stereo Switch	
U1	S-510-42 or S-524-26	Reverberation Unit	
PL1	58-214	Plug	
PL1	58-214	Plug	

CHASSIS 5G29

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2376	47 mmf Disc	500 V

CHASSIS 5G29 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C2	22-18	.0022 mfd Disc	500 V
C3	22-1842	.0047 mfd	200 V
C4	22-2376	47 mmf Disc	500 V
C5	22-18	.0022 mfd Disc	500 V
C6	22-1842	.0047 mfd	200 V
C7	22-1156	40 mfd Electrolytic	25 V
C8	22-1844	.047 mfd	600 V
C9	22-2302	470 mmf	500 V
C10	22-18	.0022 mfd Disc	500 V
C11	22-18	.0022 mfd Disc	500 V
C12	22-13	.0033 mfd Disc	500 V
C13	22-2565	.01 mfd	200 V
C14	22-1901	.033 mfd	600 V
C15			
C16	22-2376	47 mmf Disc	500 V
C17	22-1901	.033 mfd	600 V
C18	22-1844	.047 mfd	600 V
C19	22-2302	470 mmf	500 V
C20	22-18	.0022 mfd Disc	500 V
C21	22-18	.0022 mfd Disc	500 V
C22	22-13	.0033 mfd Disc	500 V
C23	22-2565	.01 mfd	200 V
C24			
C25	22-1779	.01 mfd	600 V
C26	22-2376	47 mmf Disc	500 V
C27			
C28			
C29A		80 mfd Electrolytic	450 V
C29B	22-3245	40 mfd Electrolytic	450 V
C29C		20 mfd Electrolytic	350 V
C30	22-1156	40 mfd Electrolytic	25 V
C31	22-17	.001 mfd Disc	500 V
C32	22-17	.001 mfd Disc	500 V
C33	22-14	.0047 mfd Disc	500 V
C34	22-14	.0047 mfd Disc	500 V
R1A	63-4447	2 Megohm Loudness Control (Front)	
R13		2 Megohm Loudness Control (Rear)	
R2A	63-4448	1 Megohm Treble Control (Front)	
R2B		1 Megohm Treble Control (Rear)	
R3A	63-4449	1 Megohm Bass Control (Front)	
R3B		1 Megohm Bass Control (Rear)	
R4	63-2019	150 Ohm	2
R5	63-3259	1750 Ohm	5 W
R6	63-3066	10 K Ohm	20 W
T1	95-1650	Output Transformer	
T2	95-1650	Output Transformer	
T3	95-1837	Power Transformer	
F1	136-31	4 Amp. Fuse	
SP1	49-852	12" P.M. Speaker	
SP2	49-856	5" P.M. Speaker	
SP3	49-782 or 49-972	3-1/2" P.M. Speaker 4" P.M. Speaker	

CHASSIS 7H30

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2703	220 Mmfd. Disc	500 V
C2	22-1775	.047 Mfd.	400 V
C3	22-2397	100 Mmfd. ± 10% Disc	500 V
C4	22-1841	.1 Mfd.	600 V
C5	22-1841	.1 Mfd.	600 V
C6	22-2703	220 Mmfd. Disc	500 V
C7	22-1775	.047 Mfd.	400 V
C8	22-2397	100 Mmfd. ± 10% Disc	500 V
C9	22-1841	.1 Mfd.	600 V
C10	22-1841	.1 Mfd.	600 V
C11	22-3320	100 Mfd. Electrolytic	25 V
C12	22-1813	.022 Mfd.	600 V

CHASSIS 7H30 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C13	22-2436	.0022 Mfd. Tubular	200 V
C14A		40 Mfd. Electrolytic	450 V
C14B	22-3099	70 Mfd. Electrolytic	450 V
C14C		80 Mfd. Electrolytic	450 V
R1	63-4468	100 Ohm Potentiometer	
R2	63-4898	73 Ohm ± 5%	4 W
R3	63-4468	100 Ohm Potentiometer	
R4	63-3296	1 K Ohm ± 10%	7 W
R5	63-4425	1 K Ohm ± 10%	4 W
T1	95-1913	Output Transformer	
T2	95-1913	Output Transformer	
T3	95-1923	Power Transformer	
PL-1	100-249	6.3 V 150 MA – Pilot Light (Record Compartment)	
F1	136-31	4 Amp. Fuse Type 3AG	

CHASSIS 7H31

REF. NO.	PART NO.	DESCRIPTION	
C1	22-2703	220 Mmf. Disc	500 V
C2	22-1775	.047 Mfd.	400 V
C3	22-2397	100 Mmf. Disc	
C4	22-1841	.1 Mfd.	600 V
C5	22-1841	.1 Mfd.	600 V
C6	22-2703	220 Mmf. Disc	500 V
C7	22-1775	.047 Mfd.	400 V
C8	22-2397	100 Mmf. Disc	
C9	22-1841	.1 Mfd.	600 V
C10	22-1841	.1 Mfd.	600 V
C11	22-3320	100 Mfd. Electrolytic	25 V
C12	22-1779	.01 Mfd.	600 V
C13	22-2061	.1 Mfd.	400 V
C14	22-2167	.22 Mfd.	200 V
C15A		40 Mfd. Electrolytic	450 V
C15B	22-3099	70 Mfd. Electrolytic	450 V
C15C		80 Mfd. Electrolytic	450 V
R1	63-4468	100 Ohm Current Balance Control	
R2	63-4898	73 Ohm	7 W
R3	63-4468	100 Ohm Current Balance Control	
R4	63-4895	640 Ohm	15 W
R5	63-4894	560 Ohm	7 W
R6	63-4630	2750 Ohm	10 W
PL1	100-249	Pilot Light	6.3 V .15 Amp.
PL2	100-249	Pilot Light	6.3 V .15 Amp.
T1	95-1913	Output Transformer	
T2	95-1913	Output Transformer	
T3	95-1914	Power Transformer	
F1	136-31	4 Amp. Fuse Type 3AG	

CHASSIS 8H30

REF. NO.	PART NO.	DESCRIPTION	
C1	22-3535	390 Mmf. Ceramic Disc	500 V
C2	22-3076	10 Mfd. Electrolytic	25 V
C3	22-3	.01 Mfd. Ceramic Disc	500 V
C4	22-3	.01 Mfd. Ceramic Disc	500 V
C5	22-3535	390 Mmf. Ceramic Disc	500 V
C6	22-18	.0022 Mfd. Ceramic Disc	500 V
C7	22-18	.0022 Mfd. Ceramic Disc	500 V
C8	22-3	.01 Mfd. Ceramic Disc	500 V
C9	22-3	.01 Mfd. Ceramic Disc	500 V
C10	22-1777	.1 Mfd. Capacitor	200 V

CHASSIS 8H30 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C11	22-1841	.1 Mfd. Capacitor	600 V
C12	22-1777	.1 Mfd. Capacitor	200 V
C13	22-1841	.1 Mfd. Capacitor	600 V
C14	22-14	.0047 Mfd. Ceramic Disc	500 V
C15	22-2939	680 Mmf. Ceramic Disc	500 V
C16	22-17	.001 Mfd. Ceramic Disc	500 V
C17	22-9	100 Mmf. Ceramic Disc	500 V
C18	22-1842	.0047 Mfd. Capacitor	200 V
C19	22-2565	.01 Mfd. Capacitor	200 V
C20	22-2939	680 Mmf. Ceramic Disc	500 V
C21	22-17	.001 Mfd. Ceramic Disc	500 V
C22	22-9	100 Mmf. Ceramic Disc	500 V
C23	22-14	.0047 Mfd. Ceramic Disc	500 V
C24	22-1842	.0047 Mfd. Capacitor	200 V
C25	22-2565	.01 Mfd. Capacitor	200 V
C26A		40 Mfd. Electrolytic	450 V
C26B	22-3536	80 Mfd. Electrolytic	450 V
C26C		40 Mfd. Electrolytic	450 V
C26D		40 Mfd. Electrolytic	25 V
C27	22-1779	.01 Mfd. Capacitor	600 V
C28	22-14	.0047 Mfd. Ceramic Disc	500 V
C29	22-14	.0047 Mfd. Ceramic Disc	500 V
C30	22-9	100 Mmfd. ± 10%	500 V
C31	22-9	100 Mmfd. ± 10%	500 V
R1	63-4828	130 Ohm	4 W
R2A	63-4830	1 Megohm Treble Control (Front)	
R2B		1 Megohm Treble Control (Rear)	
R3A	63-4829	5 Megohm Bass Control (Front)	
R3B		5 Megohm Bass Control (Rear)	
R4A	63-4447	2 Megohm Loudness Control (Front)	
R4B		2 Megohm Loudness Control (Rear)	
R5	63-2300	4.7 K. Ohm	2 W
R6	63-4834	2.5 K. Ohm	4 W
T1	95-1892	Output Transformer	
T2	95-1892	Output Transformer	
T3	95-1893	Power Transformer	
F1	136-31	4 Amp. Fuse Type 3AG	

CHASSIS 9H20

REF. NO.	PART NO.	DESCRIPTION	
C21	22-8	.0022 Mfd. Disc	1000 V
C22	22-3	.01 Mfd. Disc	500 V
C23	22-8	.0022 Mfd. Disc	1000 V
C24	22-5	100 Mmfd. Disc	500 V
C25	22-3	.01 Mfd. Disc	500 V
C26	22-1778	.047 Mfd. Paper	200 V
C27	22-3255	330 Mmfd. Disc	500 V
C28	22-3255	330 Mmfd. Disc	500 V
C29	22-3255	330 Mmfd. Disc	500 V
C30	22-3618	10 Mfd. Electrolytic	500 V
C31	22-3648	120 Mmfd. Mica	500 V
C32	22-3616	1 Mfd. Electrolytic	50 V
C33	22-1778	.047 Mfd. Paper	200 V
C34A		Ant. Tuning	
C34B		Ant. Trimmer	
C34C	22-3607	Conv. Tuning	
C34D		Conv. Trimmer	
C34E		Osc. Tuning	
C34F		Osc. Trimmer	
C35	22-7	.001 Mfd. Disc	
C36	22-1778	.047 Mfd. Paper	200 V
C37	22-2370	50 Mmfd. Disc	500 V
C38	22-3	.01 Mfd. Disc	500 V
C39	22-3	.01 Mfd. Disc	500 V
C40	22-3	.01 Mfd. Disc	500 V
C41	22-13	.0033 Mfd. Disc	500 V
C42	22-3	.01 Mfd. Disc	500 V
C43	22-3512	.01 Mfd. Disc	1 000 V
C44	22-3612	560 Mmfd. Mica	300 V

CHASSIS 9H20 (Cont'd).

REF. NO.	PART NO.	DESCRIPTION	
C45	22-3	.01 Mfd. Disc	500 V
C46	22-3626	.22 Mfd. Paper	100 V
C47	22-3635	2200 Mmfd. Mica	300 V
C48	22-1777	.1 Mfd. Paper	200 V
C49	22-3626	.22 Mfd. Paper	100 V
C50	22-3613	.001 Mfd. Mica	500 V
C51	22-3611	150 Mmfd. Mica	500 V
C52	22-2456	180 Mmfd. Mica	500 V
C53	22-3634	.47 Mfd. Paper	200 V
C54	22-3627	.047 Mfd. Paper	100 V
C55	22-2878	.1 Mfd. Paper	100 V
C56	22-3	.01 Mfd. Disc	500 V
C57			
C58	22-3	.01 Mfd. Disc	500 V
C59	22-3	.01 Mfd. Disc	500 V
C60A		60 Mfd. Electrolytic	150 V
C60B	22-3636	150 Mfd. Electrolytic	150 V
C60C		150 Mfd. Electrolytic	150 V
C61	22-3255	330 Mmfd. Disc	500 V
C62	22-16	470 Mmfd. Disc	500 V
C63	22-16	470 Mmfd. Disc	500 V
C64	22-3255	330 Mmfd. Disc	500 V
C65	22-3	.01 Mfd. Disc	500 V
C66	22-3	.01 Mfd. Disc	500 V
R1	63-947	27 K	2 W
R2	63-4880	25 K Pot	
R3	63-2920	1.5 K Pot	
R4	63-4896	440 ±10%	3 W
R5	63-3197	22	1 W
L7	IN T2	2nd I.F. Transformer Primary FM	
L8	IN T2	2nd I.F. Transformer Secondary FM	
L9	IN T3	2nd I.F. Transformer Primary AM	
L10	IN T3	2nd I.F. Transformer Secondary AM	
L11	IN T4	3rd I.F. Transformer Primary FM	
L12	IN T4	3rd I.F. Transformer Secondary FM	
L13	IN T5	3rd I.F. Transformer Primary AM	
L14	IN T5	3rd I.F. Transformer Secondary AM	
L15	IN T6	Ratio Detector Primary 1	
L16	IN T6	Ratio Detector Primary 2	
L17	IN T6	Ratio Detector Secondary	
L18	S-54500	Antenna Assembly AM	
L19	S-54156	Detector Coil BC	
L20	S-54155	B.C. Oscillator Coil	
L21	IN T7	1st AM I.F. Transformer Primary	
L22	IN T7	1st AM I.F. Transformer Secondary	
L23	S-54469	Doubler Coil	
L24	S-54065	Trap Coil 67 KC	
L25	S-54467	Detector Coil	
L26	S-54066	Input Coil	
T2	95-1919	2nd FM I.F. Transformer	
T3	95-1924	2nd AM I.F. Transformer	
T4	95-1919	3rd FM I.F. Transformer	
T5	95-1917	3rd AM I.F. Transformer	
T6	95-1920	Ratio Detector Transformer	
T7	95-1915	1st AM I.F. Transformer	
T8	95-1925	Amp. Power Transformer	
SE1	212-223	Selenium Rectifier	
S1	85-71 1	Band Switch	
S2	85-712	Audio Level Control Switch	
S3	85-71 5	Monaural-Multiplex Switch	
PL1	100-2 49	Pilot Light #1847	
PL2	100-2 49	Pilot Light #1847	
PL3	100-2 75	Neon	
U1	105-4-2	RC Network	
U2	105-50	38 KC Filter Network	
U3	105-50	38 KC Filter Network	
X1	103-23	Crystal Diode	
X2	103-23	Crystal Diode	

CHASSIS 9H21

REF. NO.	PART NO.	DESCRIPTION	
C21	22-8	.0022 Mfd. Disc	1000 V
C22	22-3	.01 Mfd. Disc	500 V
C23	22-8	.0022 Mfd. Disc	1000 V
C24	22-5	100 Mmfd. Disc	500 V
C25	22-3	.01 Mfd. Disc	500 V
C26	22-1778	.047 Mfd. Paper	200 V
C28	22-3255	330 Mmfd. Disc	500 V
C29	22-3255	330 Mmfd. Disc	500 V
C30	22-3618	10 Mfd. Electrolytic	500 V
C31	22-3648	120 Mmfd. Mica	500 V
C32	22-3616	1 Mfd. Electrolytic N.P.	50 V
C33	22-1778	.047 Mfd. Paper	200 V
C34A		Ant. Tuning	
C34B		Ant. Trimmer	
C34C	22-3607	Conv. Tuning	
C34D		Conv. Trimmer	
C34E		Oscillator Tuning	
C34F		Oscillator Trimmer	
C35	22-7	.001 Mfd. Disc	
C36	22-1778	.047 Mfd. Paper	200 V
C37	22-2370	50 Mmfd. Disc	500 V
C38	22-3	.01 Mfd. Disc	500 V
C39	22-3	.01 Mfd. Disc	500 V
C40	22-3	.01 Mfd. Disc	500 V
C41	22-13	.0033 Mfd. Disc	500 V
C42	22-3	.01 Mfd. Disc	500 V
C43			
C44	22-3612	560 Mmfd. Mica	300 V
C45	22-3	.01 Mfd. Disc	500 V
C46	22-3626	.22 Mfd. Paper	100 V
C47	22-3635	2200 Mmfd. Mica	300 V
C48	22-1777	.1 Mfd. Paper	200 V
C49	22-3626	.22 Mfd. Paper	100 V
C50	22-3613	.001 Mfd. Mica	
C51	22-3611	150 Mmfd. Mica	
C52	22-2456	180 Mmfd. Mica	
C53	22-3634	.47 Mfd.	200 V
C54	22-3627	.047 Mfd. Paper	100 V
C55	22-2878	.1 Mfd. Paper	100 V
C56	22-3	.01 Mfd. Disc	500 V
C57			
C58	22-3	.01 Mfd. Disc	500 V
C59	22-3	.01 Mfd. Disc	500 V
C60A		60 Mfd. Electrolytic	150 V
C60B	22-3636	150 Mfd. Electrolytic	150 V
C60C		150 Mfd. Electrolytic	150 V
C61	22-1813	.022 Mfd. Paper	600 V
C62			
C63			
C64			
C65	22-3	.01 Mfd. Disc	500 V
C66	22-3	.01 Mfd. Disc	500 V
R1	63-947	27K ±10%	2 W
R2	63-4880	25K Pot	
R3	63-2920	1.5K Pot	
R4	63-4896	440 ±10%	3 W
R5	63-3197	22 ±20%	1 W
L7	IN T2	2nd I.F. Transformer Primary FM	
L8	IN T2	2nd I.F. Transformer Secondary FM	
L9	IN T3	2nd I.F. Transformer Primary AM	
L10	IN T3	2nd I.F. Transformer Secondary AM	
L11	IN T4	3rd I.F. Transformer Primary FM	
L12	IN T4	3rd I.F. Transformer Secondary FM	
L13	IN T5	3rd I.F. Transformer Primary AM	
L14	IN T5	3rd I.F. Transformer Secondary AM	
L15	IN T6	Ratio Detector Primary 1	
L16	IN T6	Ratio Detector Primary 2	
L17	IN T6	Ratio Detector Secondary	
L18	S-54773	Antenna Wavemagnet	
L19	S-54156	Detector Coil BC	
L20	S-54155	B.C. Oscillator Coil	
L21	IN T7	1st AM I.F. Transformer Primary	
L22	IN T7	1st AM I.F. Transformer Secondary	
L23	S-54469	Doubler Coil	

CHASSIS 9H21 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION
L24	S-54065	Trap Coil 67 KC
L25	S-54467	Detector Coil
L26	S-54066	Input Coil
T2	95-1919	2nd FM I.F. Transformer
T3	95-1924	2nd AM I.F. Transformer
T4	95-1919	3rd FM I.F. Transformer
T5	95-1917	3rd AM I.F. Transformer
T6	95-1920	Ratio Detector Transformer
T7	95-1915	1st AM I.F. Transformer
T8	95-1925	Power Transformer Amp.
S1	85-711	Band Switch
S2	85-723	MX-Monaural Switch
SE1	212-23	Selenium Rectifier
PL1	100-239	Pilot Light #1847
PL2	100-249	Pilot Light #1847
PL3	100-275	Neon
U1	105-42	RC Network
U2	105-50	38 KC Filter Network
U3	105-50	38 KC Filter Network
X2	103-23	Crystal Diode
X3	103-23	Crystal Diode

CHASSIS 9H22

REF. NO.	PART NO.	DESCRIPTION	
C1	22-7	.001 Disc	500 V
C2	22-2732	.001 Feed Thru	
C3	22-1888	.001 Ceramic	500 V
C4	22-3649	25 Disc ± 5%	500 V
C5	22-3318	.001 Disc	25 V
C6	22-3035	12 ±5% Disc	500 V
C7	22-3621	22 ±5% Disc	500 V
C8	22-3035	12 ±5% Disc	500 V
C9	22-2374	6 ±5% Disc	500 V
C10	22-3	.01 Disc	500 V
C11	22-2732	.001 F.T.	
C12	22-3	.01 Disc	500 V
C13	22-2732	.001 F.T.	
C14	22-2732	.001 F.T.	
C15	22-2896	16 ±10% Disc	500 V
C16	22-3	.01 Disc	500 V
C17	22-8	.0022 Disc	500 V
C18	22-3	.01 Disc	500 V
C19	22-8	.0022 Disc	500 V
C20	22-3	.01 Disc	500 V
C21	22-1778	.047 Paper	200 V
C22	22-3	.01 Disc	500 V
C23	22-3	.01 Disc	500 V
C24	22-3255	330 ±10% Disc	500 V
C25	22-3255	330 ±10% Disc	500 V
C26	22-3255	330 ±10% Disc	500 V
C27	22-6	470 Disc	500 V
C28	22-3618	10 mfd Electrolytic	50 V
C29	22-2666	120 ±5% Mica	500 V
C30	22-3612	560 ±5% Mica	500 V
C31	22-3	.01 Disc	500 V
C32	22-3627	.047 ±10% Paper	100 V
C33	22-3655	1200 ±5% Mica	100 V
C34	22-3626	.22 ±10% Paper	500 V
C35	22-3613	.001 ±5% Mica	
C36	22-2456	180 ±10% Mica	500 V
C37	22-3611	150 ±5% Mica	500 V
C38	22-3616	1 mfd Paper	
C39	22-2	220 ±10% Disc	500 V
C40	22-3	.01 Disc	500 V
C41	22-3	.01 Disc	500 V
C42	22-3612	560 ±5% Mica	500 V
C43	22-3612	560 ±5% Mica	500 V
C44	22-14	.0047 ±10% Mica	500 V
C45	22-14	.0047 ±10% Mica	500 V
C46	22-2655	.01 Disc	1400 V
C47	22-1777	.1 Paper	200 V
C48	22-3	.01 Disc	500 V

CHASSIS 9H22 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C49	22-13	.0033 Disc	500 V
C50A		60 mfd	150 V
C50B	22-3636	150 mfd Electrolytic	150 V
C50C		150 mfd	150 V
C51	22-1852	7.5 mmf Ceramic	500 V
C52	22-3	.01 Disc	500 V
C53	22-3	.01 Disc	500 V
C54	22-2732	1000 F.T.	
C55	22-2732	1000 F.T.	
C56	22-2655	.01 Disc	1400 V
R1	63-4095	10K Pot.	
R2	63-4420	10K ±10%	1 W
R3	63-4880	25K Pot	
R4A	63-4496	1 Meg Tone Control	
R4B		2 Meg Volume Control	
R5	63-4890	440 ±10%	3 W
T1	95-1900	1st I.F. Transformer 10.7 MC	
T2	95-1864	2nd I.F. Transformer 10.7 MC	
T3	95-1915	Limiter Transformer 10.7 MC	
T4	95-1920	Ratio Detector Transformer 10.7 MC	
T5	95-1936	Audio Output Transformer	
L1	S-52362	FM Antenna Coil	
L2	S-13871	FM Detector Coil	
L3	S-52359	FM Oscillator Coil	
L4	1N T1		
L5	1N T1		
L6	1N T2		
L7	1N T2		
L8	1N T3		
L9	1N T3		
L10	1N T4		
L11	1N T4		
L12	S-54066	Input Coil	
L13	S-54809	Doubler Coil	
L14	S-54065	Trap Coil	
L15	S-54807	Detector Coil	
X1	103-39	AFC Diode	
X2	103-23	Diode	
X3	103-23	Diode	
X4	212-23	100 MA Selinium Rectifier	
U1	105-42	RC Network	
PL1	100-75	Neon Indicator	
S1	85-720	A.F.C. Switch	
S2	85-721	Selector Switch	
S3	85-495	Phasing Switch	

CHASSIS 12H26

REF. NO.	PART NO.	DESCRIPTION	
C18	22-8	.0022 Mfd. Disc	1000 V
C19	22-3363	470 Mmfd. Disc	500 V
C20	22-3	.01 Mfd. Disc	500 V
C21	22-8	.0022 Mfd. Disc	1000 V
C22	22-2	220 Mmfd. Disc	500 V
C23	22-3	.01 Mfd. Disc	500 V
C24	22-2863	33 Mmfd. Disc	500 V
C25	22-3	.01 Mfd. Disc	500 V
C26	22-3	.01 Mfd. Disc	500 V
C27	22-3	.01 Mfd. Disc	500 V
C28	22-3	.01 Mfd. Disc	500 V
C29	22-2671	25 Mmfd. Disc	500 V
C30	22-3	.01 Mfd. Disc	500 V
C31	22-3	.01 Mfd. Disc	500 V
C32	22-3255	330 Mmfd. Disc	500 V
C33	22-3255	330 Mmfd. Disc	500 V
C34	22-3255	330 Mmfd. Disc	500 V
C35	22-3618	10 Mfd. Electrolytic	50 V
C36	22-2	220 Mmfd. Disc	500 V
C37	22-1778	.047 Mfd. Paper	200 V
C38A		Ant. Tuning	
C38B		Ant. Trimmer	

CHASSIS 12H26 (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	
C38C	22-3594	Det. Tuning	
C38D		Det. Trimmer	
C38E		Osc. Tuning	
C38F		Osc. Trimmer	
C39	22-3	.01 Mfd. Disc	500 V
C40	22-1778	.047 Mfd. Paper	200 V
C41	22-9	100 Mmfd. Disc	500 V
C42	22-3	.01 Mfd. Disc	500 V
C43	22-3	.01 Mfd. Disc	500 V
C44	22-3648	120 Mmfd. Mica ±.5	500 V
C45	22-3612	560 Mmfd. Mica	500 V
C46	22-3	.01 Mfd. Disc	500 V
C47	22-3626	.22 Mfd. Paper	100 V
C48	22-3614	3300 Mmfd. Mica	300 V
C49	22-2061	.1 Mfd. Paper	400 V
C50	22-3	.01 Mfd. Disc	500 V
C51	22-3616	1 Mfd. Electrolytic, Non Pole.	50 V
C52	22-3626	.22 Mfd. Paper	100 V
C53	22-3613	.001 Mfd. Mica	500 V
C54	22-3611	150 Mmfd. Mica	500 V
C55	22-2456	180 Mmfd. Mica	500 V
C56	22-3446	.47 Mfd. Paper	400 V
C57	22-3627	.047 Mfd. Paper	100 V
C58	22-3612	560 Mmfd. Mica	500 V
C59	22-3612	560 Mmfd. Mica	500 V
C60	22-3	.01 Mfd. Disc	500 V
C61	22-3	.01 Mfd. Disc	500 V
C62	22-3	.01 Mfd. Disc	500 V
C63	22-3	.01 Mfd. Disc	500 V
C64	22-3	.01 Mfd. Disc	500 V
C65	22-3	.01 Mfd. Disc	500 V
C66	22-3	.01 Mfd. Disc	500 V
C67	22-1778	.047 Paper	200 V
C68	22-2376	47 Mmfd. Disc	500 V
C69	22-18	.0022 Mfd. Disc	500 V
C70	22-14	.0047 Mfd. Disc	500 V
C71	22-3619	220 Mmfd. Disc	500 V
C72	22-3619	220 Mmfd. Disc	500 V
C73	22-178-4	.01 Mfd. Paper	400 V
C74	22-3076	10 Mfd. Electrolytic	25 V
C75	22-1778	.047 Mfd. Paper	200 V
C76	22-178-4	.01 Mfd. Paper	400 V
C77A	22-3628	10 Mfd. Electrolytic	350 V
C77B		30 Mfd. Electrolytic	350 V
C78	22-325 5	330 Mmfd.	500 V
C79	22-18	.0022 Mfd. Disc	500 V
C80	22-13	.0033 Mfd. Disc	500 V
C81	22-263 4	.047 Mfd. Paper	400 V
C82	22-263-4	.047 Mfd. Paper	400 V
C83	22-3255	330 Mmfd. Disc	500 V
C84	22-18	.0022 Mfd. Disc	500 V
C85	22-13	.0033 Mfd. Disc	500 V
C86	22-14	.0047 Mfd. Disc	500 V
C87			
C88			
C89A	22-21	.001 Mfd. Dual Disc	500 V
C89B		.001 Mfd. Dual Disc	500 V
C90	22-1844	.047 Mfd. Paper	600 V
C91	22-2376	47 Mmfd. Disc	500 V
C92	22-14	.0047 Mfd. Disc	500 V
C93	22-18	.0022 Mfd. Disc	500 V
C94	22-1779	.01 Mfd. Paper	600 V
C95	22-14	.0047 Mfd. Disc	500 V
R1	63-4093	27 K	2 W
R2	63-4880	25 K Pot. (Muting)	
R3	63-2920	1.5 K Pot (Separation)	
R4A	63-4872	1 Meg. Treble Front	
R4B		1 Meg. Treble Rear	
R5A	63-4871	1 Meg. Bass Front	
R5B		1 Meg. Bass Rear	
R6A	63-4883	1 Meg. Presence Front	
R6B		1 Meg. Presence Rear	
R7	63-2297	2.7 K	2 W
R8A	63-48 78	2 Meg. Loudness Front	
R8B		2 Meg. Loudness Rear	

CHASSIS 12H26 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
R9	63-4395	2200	10 W
R10	63-4475	1200	7 W
R11	63-4810	10 K	20 W
L6	IN T2	2nd FM I.F. Primary	
L7	IN T2	2nd FM I.F. Secondary	
L8	IN T3	3rd FM I.F. Primary	
L9	IN T3	3rd FM I.F. Secondary	
L10	95-1918	FM I.F. Plate Coil 10.7 MC	
L11	IN T4	Ratio Detector Primary #1	
L12	IN T4	Ratio Detector Primary #2	
L13	IN T4	Ratio Detector Secondary	
L14	IN T6	2nd AM I.F. Primary	
L15	IN T6	2nd AM I.F. Secondary	
L16	IN T7	3rd AM I.F. Primary	
L17	IN T7	3rd AM I.F. Secondary	
L18	S-18812	AM Ant. Coil Assembly	
L19	S-54156	BC Detector	
L20	S-54155	BC Oscillator	
L21	IN T5	1st AM I.F. Primary	
L22	IN T5	1st AM I.F. Secondary	
L23	S-54066	Input Coil	
L24	S-54069	Doubler Coil	
L25	S-54067	MX Detector	
L26	S-54065	67 KC. Trap	
L27	S-17917	AM Loop Antenna	
T2	95-1919	2nd FM I.F. Transformer	
T3	95-1919	3rd FM I.F. Transformer	
T4	95-1920	Ratio Detector	
T5	95-1915	1st AM I.F. Transformer	
T6	95-1916	2nd AM I.F. Transformer	
T7	95-1917	3rd AM I.F. Transformer	
S1	85-709	Band Switch	
S2	85-714	Stereo Selector Switch	
S3	85-715	Power Switch	
S4	85-723	Multiplex Disabling Switch	
		Extended Stereo Disabling Switch	
X2	103-34	Crystal Diode	
X3	103-34	Crystal Diode	
PL1	100-249	Pilot Light #1847	
PL2	100-249	Pilot Light #1847	
PL3	100-249	Pilot Light #1847	
PL4	100-249	Pilot Light #1847	
PL5	100-249	Pilot Light #1847	
PL6	100-249	Pilot Light #1847	
PL7	S-54502	Multiplex Indicator Light	

CHASSIS 14H25

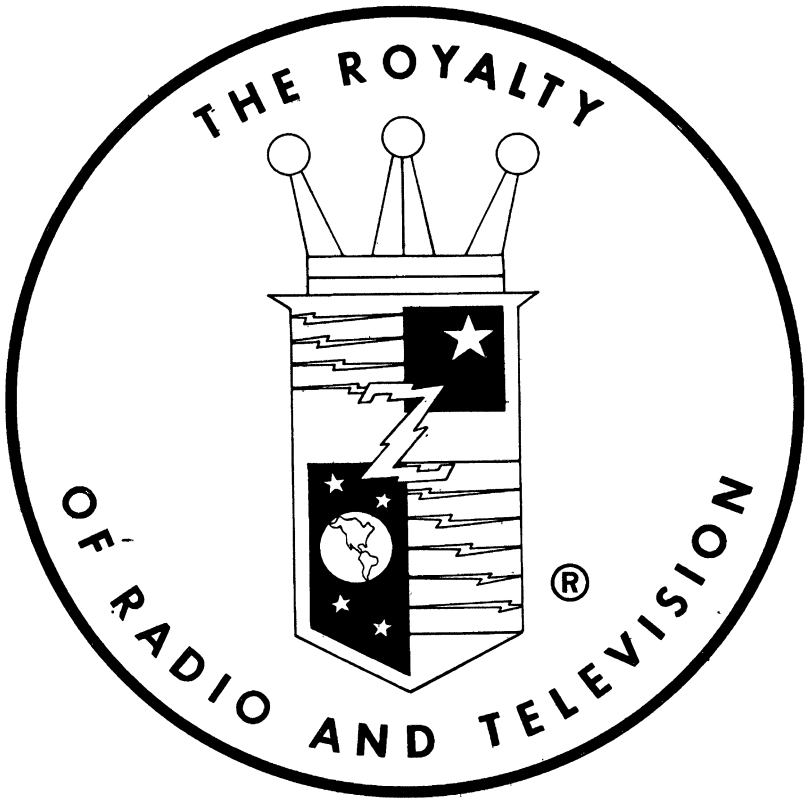
REF. NO.	PART NO.	DESCRIPTION	
C18	22-8	.0022 Mfd. Disc	1000 V
C19	22-3363	470 Mmfd. Disc	500 V
C20	22-3	.01 Mfd. Disc	500 V
C21	22-8	.0022 Mfd. Disc	1000 V
C22	22-2	220 Mmfd. Disc	500 V
C23	22-3	.01 Mfd. Disc	500 V
C24	22-9	100 Mmfd. Disc	500 V
C25	22-3	.01 Mfd. Disc	500 V
C26	22-3	.01 Mfd. Disc	500 V
C27	22-3	.01 Mfd. Disc	500 V
C28	22-3	.01 Mfd. Disc	500 V
C29	22-2671	25 Mmfd. Disc	500 V
C30	22-3	.01 Mfd. Disc	500 V
C31	22-3	.01 Mfd. Disc	500 V
C32	22-3255	330 Mmfd. Disc	500 V
C33	22-3255	330 Mmfd. Disc	500 V
C34	22-3255	330 Mmfd. Disc	500 V
C35	22-3618	10 Mfd. Electrolytic	50 V
C36	22-2	220 Mmfd. Disc	500 V

CHASSIS 14H25 (Cont'd)

REF. NO.	PART NO.	DESCRIPTION	
C37	22-1778	.047 Mfd. Paper	200 V
C38A		Ant. Tuning	
C38B		Ant. Trimmer	
C38C	22-3594	Det. Tuning	
C38D		Det. Trimmer	
C38E		Osc. Tuning	
C38F		Osc. Trimmer	
C39	22-3	.01 Mfd. Disc	500 V
C40	22-1778	.047 Mfd. Paper	200 V
C41	22-9	100 Mmfd. Disc	500 V
C42	22-3	.01 Mfd. Disc	500 V
C43	22-3	.01 Mfd. Disc	500 V
C44	22-3648	120 Mmfd. Mica	
C45	22-3612	500 Mmfd. Mica	
C46	22-3	.01 Mfd. Disc	500 V
C47	22-3626	.22 Mfd. Paper	100 V
C48	22-3614	3300 Mmfd. Mica	300 V
C49	22-2061	.1 Mfd. Paper	400 V
C50	22-3363	470 Mmfd. Disc	500 V
C51	22-3616	1 Mfd. Electrolytic, Non Pole.	50 V
C52	22-3626	.22 Mfd. Paper	100 V
C53	22-3613	.001 Mfd. Mica	
C54	22-3611	150 Mmfd. Mica	
C55	22-2456	180 Mmfd. Mica	
C56	22-3446	.47 Mfd. Paper	400 V
C57	22-3627	.047 Mfd. Paper	100 V
C58	22-3612	560 Mmfd. Mica	
C59	22-3612	560 Mmfd. Mica	
C60	22-3363	470 Mmfd. Disc	500 V
C61	22-3363	470 Mmfd. Disc	500 V
C62	22-3	.01 Mfd. Disc	500 V
C63	22-3	.01 Mfd. Disc	500 V
C64	22-3	.01 Mfd. Disc	500 V
C65	22-3	.01 Mfd. Disc	500 V
C66	22-17	.001 Mfd. Disc	1000 V
C67	22-3608	68 Mmfd. Disc	500 V
C68	22-3076	10 Mfd. Paper	25 V
C69	22-2565	.01 Mfd. Paper	200 V
C70	22-2863	33 Mmfd. Disc	500 V
C71	22-3608	68 Mmfd. Disc	
C72	22-17	.001 Mfd. Disc	1000 V
C73	22-2129	.022 Mfd. Paper	600 V
C74	22-2704	.0068 Mfd. Disc.	500 V
C75	22-2431	.0082 Mfd. Paper	200 V
C76	22-2129	.022 Mfd. Paper	600 V
C77	22-3565	.01 Mfd. Paper	200 V
C78	22-2704	.0068 Mfd. Disc	500 V
C79	22-1777	.1 Mfd. Paper	200 V
C80	22-2863	33 Mmfd. Disc	500 V
C81	22-1781	.022 Mfd. Paper	200 V
C82	22-2704	.0068 Mfd. Disc	500 V
C83	22-2431	.0082 Mfd. Paper	200 V
C84	22-1781	.022 Mfd. Paper	200 V
C85	22-2704	.0068 Mfd. Disc	500 V
C86	22-2129	.022 Mfd. Paper	600 V
C87	22-2397	100 Mmfd. Disc	500 V
C88	22-18	.022 Mfd. Disc	500 V
C89	22-2565	.01 Mfd. Paper	200 V
C90	22-14	.0047 Mfd. Disc	500 V
C91	22-2129	.022 Mfd. Paper	600 V
C92	22-2	220 Mmfd. Disc	500 V
C93	22-2	220 Mmfd. Disc	500 V
C94	22-2397	100 Mmfd. Disc	500 V
C95	22-18	.0022 Mfd. Disc	500 V
C96	22-2565	.01 Mfd. Paper	200 V
C97	22-14	.0047 Mfd	
C98	22-3626	.22 Mfd. Paper	100 V
C99	22-1844	.047 Mfd. Paper	600 V
C100	22-1841	.1 Mfd. Paper	600 V
C101	22-3615	1 Mfd. Electrolytic	25 V
C102	22-17	.001 Mfd. Disc	1000 V
C103	22-3404	1 Mfd. Paper	400 V
C104	22-3518	.047 Mfd. Paper	200 V

CHASSIS 14H25 (Cont'd.)

REF. NO.	PART NO.	DESCRIPTION	
C105	22-3518	.047 Mfd. Paper	200 V
C106	22-3518	.047 Mfd. Paper	200 V
C107	22-3518	.047 Mfd. Paper	200 V
C108A	22-3617	20 Mfd. Electrolytic	400 V
C108B		20 Mfd. Electrolytic	400 V
C109	22-1813	.022 Mfd. Paper	600 V
C110	22-3	.01 Mfd. Disc	500 V
C111	22-3610	330 Mmfd. Disc	500 V
C112	22-3239	.1 Mfd. Paper	400 V
C113	22-3	.01 Mfd. Disc	500 V
R1	63-4093	27 K	2 W
R2	63-4880	25 K Pot. (Muting)	
R3	63-2920	1.5 K Pot. (Separation)	
R4A	63-4878	2 Meg. Vol. Front	
R4B	63-4878	2 Meg. Vol. Cont. Rear	
R5A	63-4871	1 Meg. Bass Front	
R5B	63-4871	1 Meg. Bass Rear	
R6A	63-4872	1 Meg. Treble Front	
R6B	63-4872	1 Meg. Treble Rear	
R7	63-4093	27 K	2 W
R8	63-4882	5 K	7 W
R9A	63-4873	2 K Front Presence	
R9B	63-4873	2 K Rear Presence	
R10	63-4897	2.2 K	3 W
R11	63-4879	500 K Reverberation Control	
L6	IN T2	2nd FM I.F. Transformer Primary	
L7	IN T2	2nd FM I.F. Transformer Secondary	
L8	IN T3	3rd FM I.F. Transformer Primary	
L9	IN T3	3rd FM I.F. Transformer Secondary	
L10	95-1918	4th FM I.F. Coil	
L11	IN T4	Ratio Detector Primary #1	
L12	IN T4	Ratio Detector Primary #2	
L13	IN T4	Ratio Detector Secondary	
L14	IN T6	2nd AM I.F. Transformer Primary	
L15	IN T6	2nd AM I.F. Transformer Secondary	
L16	IN T7	3rd AM I.F. Transformer Primary	
L17	IN T7	3rd AM I.F. Transformer Secondary	
L18	S-18812	Ant. Coil AM	
L19	S-54156	AM Detector Coil Assembly	
L20	S-54155	BC Oscillator Coil	
L21	IN T5	1st AM I.F. Primary	
L22	IN T5	1st AM I.F. Secondary	
L23	S-54066	Input Coil	
L24	S-54069	Doubler	
L25	S-54067	Detector Coil, 38 KC	
L26	S-54065	67 KC Trap	
L27	S-17917	AM Cabinet Ant.	
T2	95-1919	2nd FM I.F. Transformer	
T3	95-1919	3rd FM I.F. Transformer	
T4	95-1920	Ratio Detector	
T5	95-1915	1st AM I.F. Transformer	
T6	95-1916	2nd AM I.F. Transformer	
T7	95-1917	3rd AM I.F. Transformer	
X2	103-34	Crystal Diode	
X3	103-34	Crystal Diode	
S1	85-710	Band Switch	
S2	85-708	Stereo Switch	
S3	ON 63-4879	A.C. Switch	
S4	85-723	Multiplex Disabling Switch	
PL1	100-249	#1847	
PL2	100-249	#1847	
PL3	100-249	#1847	
PL4	100-249	#1847	
PL5	100-249	#1847	
PL6	100-249	#1847	
PL7	100-273	Neon Bulb & Wire	



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HF8-RR
11/61

Printed in U.S.A.