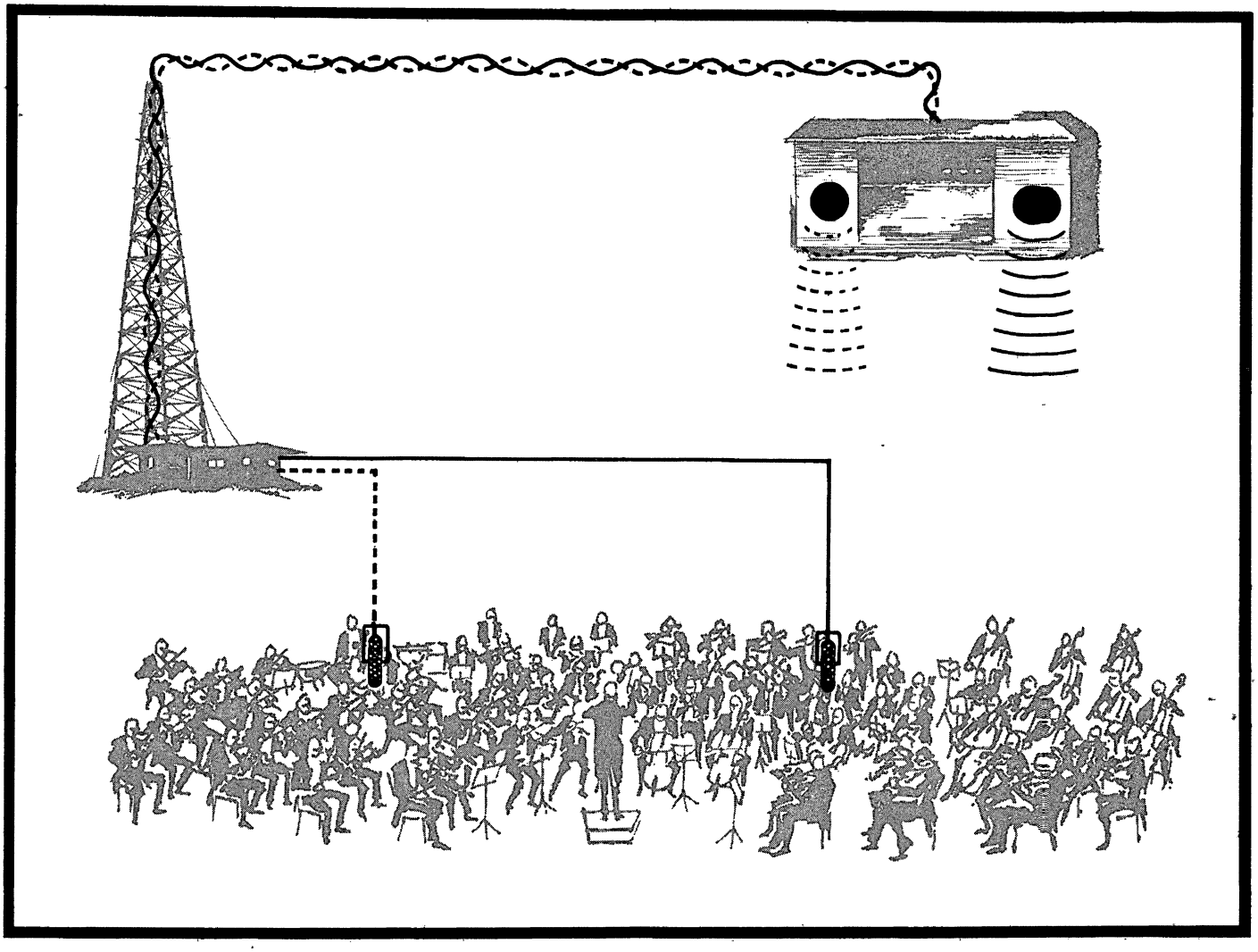
ZENITH®

SERVICE MANUAL



HIGH FIDELITY
AND STEREO FM MODELS

ZENITH RADIO CORPORATION

1900 N. AUSTIN AVENUE CHICAGO, ILLINOIS 60639

PRICE $1.50 HF 18 SUPPLEMENT PART NO. 923-576

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FEATURES OF HIGH FIDELITY & STEREO FM MODELS

CABINET			CHASSIS			SPEAKER		
MODEL	STYLE	COLOR	MODEL	TYPE	EIA POWER OUTPUT	PART NUMBER	VOICE COIL IMPED. (IN OHMS)	SIZE INCHES
A507F	Table (w/handle) (lift lid)	Green	3AT20	3 Transistor Phono Only	—	49-1184	32	1-2x6
A507L	Table (w/handle) (lift lid)	Beige	3AT20	3 Transistor Phono Only	—	49-1184	32	1-2x6
A507V	Table (w/handle) (lift lid)	Coral	3AT20	3 Transistor Phono Only	—	49-1184	32	1-2x6
A555W-1 Note 4	Table (w/handle) (lift lid)	Walnut	10ZT38	10 Transistor Phono Only	10W	49-1167 49-979	16 45	2-6x9 2-3½
A950W	Console (lift lid)	Walnut	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 2-3½ 2-Horn
A952P	Console (lift lid)	Pecan	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 2-3½ 2-Horn
A953M	Console (lift lid)	Maple	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 2-3½ 2-Horn
A955H	Console (lift lid)	Cherry	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 4-3½ 2-Horn
A957DE	Console (lift lid)	Dark Oak	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 4-3½ 2-Horn
A957P	Console (lift lid)	Pecan	25AT20	25 Transistor FM/AM/ Phono	70W	49-1171 49-1094 49-1162	6.4 45 6.4	2-12 4-3½ 2-Horn

NOTES

1. Stylus, S = Sapphire, D = Diamond.
2. Tape Input and Output - May be used with the following models:
   A632 - Cassette Tape Player/Recorder.
   A634 - Cassette Tape Player,
   A635 - Cartridge Tape Player,
   A636 - Cassette Tape Player/Recorder.
3. Built-In Sound Control Center with headphone jack.
4. Listed for model reference only, see Service Manual HF 18 (No. 923-558) for service data.

FEATURES OF HIGH FIDELITY & STEREO FM MODELS

RECORD CHANGER				OTHER FEATURES			
NUMBER	MOUNTING	CARTRIDGE	STYLUS NOTE 1	INDICATOR LIGHT	TAPE	RECORD STORAGE	REMOTE SPEAKER PROVISION
169-374	Shelf	142-170	D-S 56-567	–	–	–	–
169-373	Shelf	142-170	D-S 56-567	–	–	–	–
169-375	Shelf	142-170	D-S 56-567	–	–	–	–
169-370	Hinged Panel	142-168	D-S S-68567	–	–	–	–
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3
169-366	Shelf	142-167	D-S S-82621	Yes	Note 2	Yes	Yes Note 3

RECORD CHANGER FEATURES

PART NO.	MFG.	BASE PLATE	TURNTABLE
169-366	VM	Tree Bark Brown	Light Beige
169-370	VM	Gold	Black
169-373	BSR	Off White	Off White
169-374	BSR	Off White	Off White
169-375	BSR	Off White	Off White

GENERAL INFORMATION

THEORY

For theory and operation, of circuits covered in this manual, refer to Service Manual HF 18 (Zenith Part No. 923-558).

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 or should anyone tamper with the multiplex adjustments then, of course, realignment will be necessary.

MUTING CONTROL

A muting control, which supplies a reverse bias voltage to the base of the 19KHz 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 19KHz amplifier, carefully rotate the muting control in a 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.

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. Reduction of multipath distortion under high signal conditions may be accomplished by relocation of the receivers antenna system.

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.

AGC voltages are to be measured with a V.T.V.M. connected to the following Test Points.

Chassis 25AT20 - Test Point "C" RF amplifier AGC Feed Thru on FM Tuner.

Chassis 25AT20

Micro Volts Input	AGC Voltage At 1st I.F. (See Note)
0	1.20
25	1.12
100	.88
200	.76
500	.64
1K	* .58
5K	.49
50K	.37
100K	.25

Note - AGC voltage for chassis 25AT20 is read across the 820 ohm resistor connected from the 1st I.F. emitter to "B-" (-12.4V) refer to AGC Adjustments.

AGC ADJUSTMENTS

Chassis 25AT20 – Adjust AGC control so that under no signal conditions a voltage of 1.2 volts is measured across the 820 ohm resistor connected from 1st IF emitter to "B-" (-12.4V) when in AM.

AUTOMATIC FREQUENCY CONTROL-AFC

These receivers feature an automatic frequency control which automatically keeps your receiver on the exact station frequency when you are tuned to an FM station. To utilize this feature tune the receiver as instructed and then turn the band switch to AFC position.

When the desired FM station is a weak station, adjacent in frequency to a strong station, the AFC may pull the tuning into the stronger station. Under these conditions, place the bandswitch in FM position and tune the receiver as instructed.

Tuning the receivers on the frequency modulation band will require more care than on the broadcast band. A hissing sound may be noted when tuning between Frequency Modulation stations. This is normal, and will disappear as the station is tuned in. After a station is located, the pointer should be moved back and forth over it until the point of quietest reception and best tone quality is found. Correct tuning is indicated by the disappearance of background noise.

SPEAKER PHASING

It is most important that coded speaker leads be connected to coded terminals on speakers for proper polarity within each speaker group. It is also then most important that the speaker groups be in phase with each other. One excellent method is to play a monaural record with the volume of each speaker group equal.

Under these conditions the sound should appear to come from a point midway between the two speaker groups. If the sound comes from any other point than midpoint, then one speaker group is out of phase with the other and you should check polarity. One of the easiest methods of checking polarity within the speaker group is to momentarily place a 4½ volt battery across the speaker feed terminals. All the speaker cones should simultaneously move in the same direction.

POWER AMPLIFIERS

Power transistors and their circuits are unique in operation, therefore, repair procedure differs from those steps followed when repairing tube type-circuits.

1. Each channel of the 25AT20 amplifier use a pair of matched power transistors in the final output stage. Therefore, should one transistor fail, both transistors must be replaced simultaneously, since they will not perform properly unless matched. (In chassis using complementary symmetry circuits a matched pair consists of one NPN and one PNP transistor.)

2. When a power transistor is replaced the insulator (when used) between the transistor and the heat sink should also be replaced. On chassis 25AT20 be certain to apply Dow Corning No. 340 heat conductive grease between the transistor and the insulator. Also between the insulator and the chassis. The Dow Corning grease can be obtained in 1 c.c. quantities by ordering part No. 205-51.

3. Do not operate these amplifiers without their proper speaker load.

4. Do not short out the audio output of either channel when the amplifier is operating.

5. Should a power transistor fail (short) be certain to replace the emitter resistors for the specific channel. Also be certain to check the condition of the silicon diode rectifiers.

6. Remove plug-in transistors from their sockets before doing any soldering to the socket lugs.

CIRCUIT BOARD COMPONENT IDENTIFICATION

As a special feature to aid the Service Technician, Zenith has identified the location of components which are mounted on certain circuit boards. This information is printed on the circuit boards and also appears on the schematic. Zenith has also prepared a two-color drawing of the foil side of the circuit board showing the relationship between the components and the foil. This will aid the Technician in quickly tracing circuits, as not only are the components shown, but also the voltages at various check points. Components are identified by a letter/number combination. A letter prefix to indicate the type of component: C=Capacitor, L=Coil, R=Resistor, CR=Diode, etc. The numbers are assigned in blocks to identify the circuit, in which it is used, as follows.

Block	Stage	Example
1 - 99	FM Tuner	R1, C1, L1.
101 - 199	AM Tuner	R101, C101, L101.
201 - 299	IF	R201, C201, L201.
301 - 399	Multiplex	R301, C301, L301.
401 - 449	Audio, Right Channel	R401, C401, L401.
451 - 499	Audio, Left Channel	R451, C451, L451.
501 - 599	Power Supply	R501, C501, L501.

CIRCUIT BOARD SERVICING

Servicing circuit board sets is, in general, much the same as servicing ordinary receivers. However, certain tools and techniques are helpful for this type of work.

1. Good pair of long-nose pliers.
2. Sharp wire cutters.
3. Small stiff glue brush (for solder removal).
4. Metal pick (soldering aid).
5. Pencil type soldering iron with a small tip (25 watts or less).
6. Tin leads on component before soldering.
7. Use only solder with an extremely low melting point, (60% Tin, 40% Lead).

WARNING: Excessive heat may damage the circuit board foil during component replacement if a soldering pencil, iron or gun of higher wattage rating is used.

COMPONENT REPLACE MENT

Resistors and capacitors should be replaced by clipping out the defective part and neatly soldering in the new part. If a unit, such as the oscillator coil or I.F. transformer is to be removed, heat the mounting lugs with a pencil type soldering iron and move them away from the soldered connection with a long-nose pliers or metal pick. Continue heating the lugs and brush away the molten solder with a small stiff glue brush. Remove the defective unit before lifting it off the chassis. Before inserting the new unit, be certain that the lug holes are open and free from solder. Forcing a lug against a solder filled lug hole may break the bond between the chassis base and the wiring foil. It is, therefore, necessary to exercise care when replacing units.

An open or damaged section of circuit board wiring foil can be repaired by soldering a short jumper wire across the points to be connected. When soldering the low voltage electrolytics, transistors and diodes, the wire should be held with a pair of long nose pliers. The long nose pliers will act as a heat sink.

SIGNAL TRACING

A technique used in radio commonly known as "Screw driver testing" in which the B plus at the plate of the tube or collector of a transistor is shorted to ground to check for "clicks" in the speaker, is definitely not recommended. This practice would be comparable to shorting the collector of a transistor to ground which could damage the transistor. Standard point to point signal checking with the proper RF, IF and audio signals, should only be used.

RESISTANCE MEASUREMENTS

When making resistance measurements in the circuit, it is most important to remove any transistors in the circuit under test for accuracy in readings. Incorrect or inaccurate resistance measurements are the result of a transistor acting as a diode and conducting. When making measurements across an electrolytic capacitor, be certain the ohm meter leads are correctly polarized. Also, be certain the battery voltage of the meter does not exceed the working voltage of the capacitor; the capacitor may otherwise be damaged.

FM ALIGNMENT

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

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 400 KHz with a sweep rate of 60 Hertz 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.

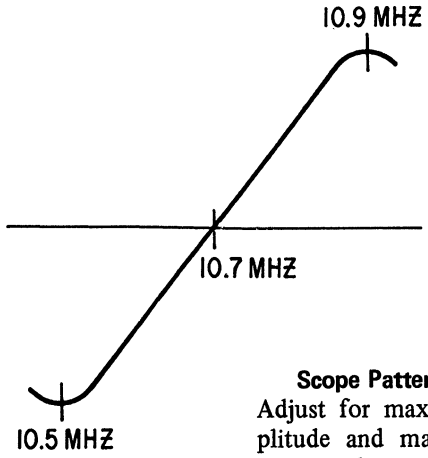
The condenser mentioned further on in the alignment procedure should be as small as possible and the ground lead of the generator must be connected to the chassis at the base of the socket, where the signal is being injected. Should the signal be injected at some point other than a socket, then the ground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

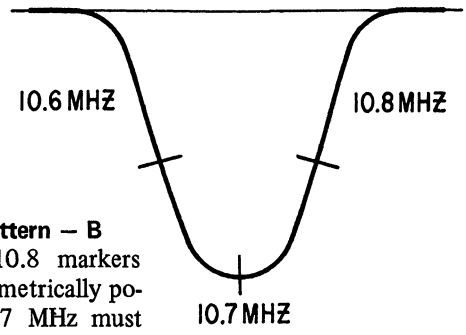
In the following alignment procedure charts there is a letter appearing in the operation column in addition to the number. This letter indicates the test point to which the hot lead of the scope is to be connected as follows:

A. Connect to Ratio Detector Test Point "H".

B. Connect to the last FM IF Test Point "G".

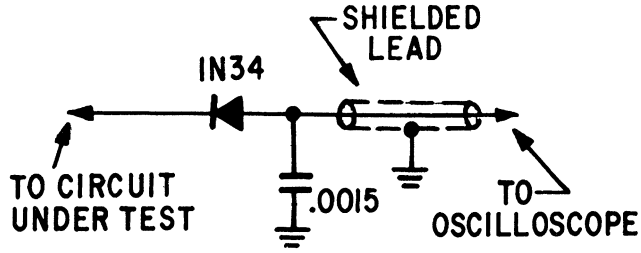


Scope Pattern – A
Adjust for maximum amplitude and maintain linearity and symmetry. 10.7 MHz must be on curve at base line.



Scope Pattern – B
10.6 and 10.8 markers must be symmetrically positioned. 10.7 MHz must be at center of curve. This point must be adjusted for maximum.

A detector probe is required. If your oscilloscope is not equipped with this probe, it can easily be constructed. For best results, this probe should be shielded.



AM ALIGNMENT

C. A V.T.V.M. on low AC scale connected across the speaker voice coil output terminals (either left or right channel), will be satisfactory for all AM, IF and RF adjustments.

Normally the Oscillator, RF and Mixer Coils and Transformers will not require adjustment unless they have been replaced or misaligned. If alignment becomes necessary the Oscillator Coil should be adjusted at 535 KHz with the tuning gang closed. Adjust the RF and Mixer Transformers at 600 KHz. These adjustments should be made after the corresponding trimmer adjustment shown in the alignment charts. Repeat the corresponding coil and trimmer adjustments for best results.

RF AND IF ALIGNMENT PROCEDURE FOR CHASSIS 25AT20

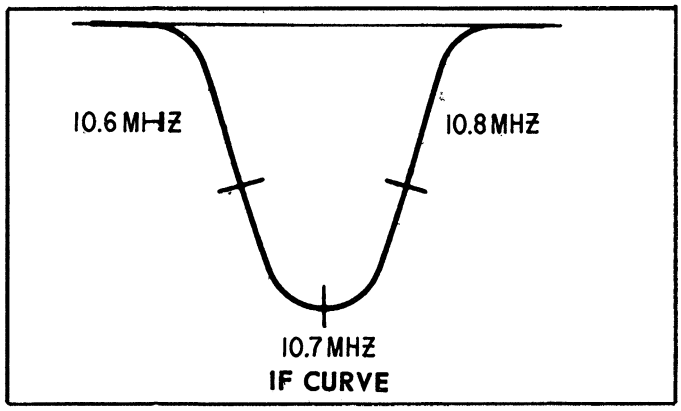
OPERATION *	CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	SET DIAL TO	ADJUST IRON CORES	PURPOSE
1 A	Term. #4 of T205 4th IF Trans.	47 ohm in shunt with gen. output. Then from hot lead a 27 ohm in series with a .001 MFD capacitor.	10.7 MHz 400 KHz Deviation	88 MHz	L213	Adjust Primary and Secondary of ratio detector for maximum amplitude and symmetry as shown in Scope Pattern "A"
2 A	Term. #4 of T205 4th IF Trans.		10.7 MHz 400 KHz Deviation	88 MHz	L214	
3 B	Term. #4 of T203 4th IF Trans. Test Point "F"		10.7 MHz 400 KHz Deviation	88 MHz	L211, L212	Align I.F. transformers for maximum output and symmetry. This pattern is not necessarily identical to the overall Scope Pattern "B"
4 B	Term. #4 of T201 2nd IF Trans. Test Point "E"		10.7 MHz 400 KHz Deviation	88 MHz	L207, L208	
5 B	Connect to emitter of Q2 Mixer Test Point "K"		10.7 MHz 400 KHz Deviation	88 MHz	L9,L10	
6 B	Connect to emitter of Q2 Mixer Test Point "K"		10.7 MHz 400 KHz Deviation	88 MHz	L5,L6	Align I.F. transformers for maximum output and symmetry as indicated in Scope Pattern "B"
7 B	Connect to emitter of Q2 Mixer Test Point "K"		10.7 MHz 400 KHz Deviation	88 MHz	Readjust L5, L6, L203, L204, L207, L208, L211, L212	
8 B	FM Antenna Post (Remove Antenna)	300 ohm	98 MHz 400 KHz Deviation	98 MHz	L7	Set oscillator to Dial Scale.
9 B	FM Antenna Post (Remove Antenna)	300 ohm	98 MHz 400 KHz Deviation	98 MHz	L3,L2,L1	Align RF output, RF input and FM Antenna stages for maximum.
10 C	Base of Q101	.05 in series with hot lead of gen.	455 KHz 400 Hertz Modulated	600 KHz	L102, L103, L205, L206, L209, L210	Align AM IF for maximum.
11 C	Two turn loop loosely coupled to wave-magnet		1600 KHz 400 Hertz Modulated	1600 KHz	C101E	Set oscillator to dial scale.
12 C	Two turn loop loosely coupled to wave-magnet		1400 400 Hertz Modulated	1400 KHz	C101D, C101A	Align detector and antenna stages.

*For A, B, C See Page 8

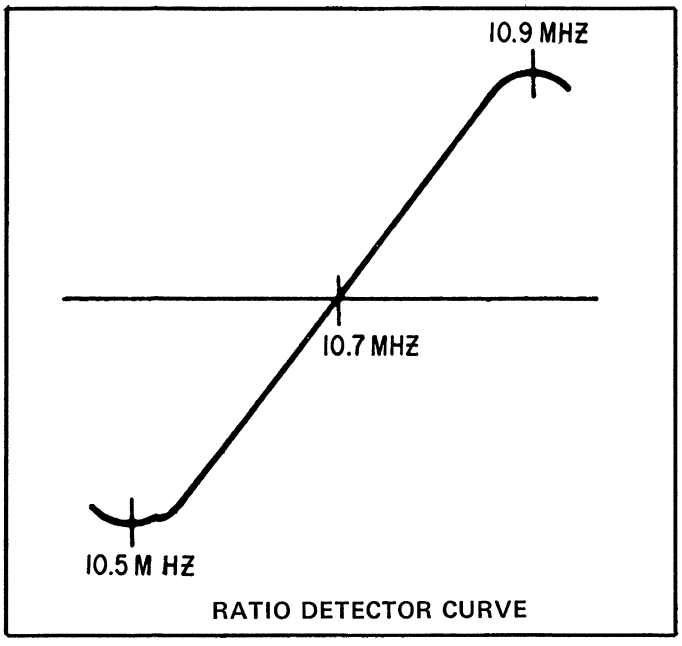
Refer to Page 6 for A.G.C. adjustment.

MULTIPLEX ALIGNMENT PROCEDURE

Using the Zenith FM multiplex signal generator, the multiplex portion of Zenith or any FM multiplex receiver can be aligned, but first before any attempt is made to do this it is necessary that the technician be certain that the RF, IF, and ratio detector alignment is correct, and that the receiver operates normally on monaural signals.



IF CURVE



RATIO DETECTOR CURVE

Because of the wide band pass required in the multiplex FM receiver, it is desirable to use an FM signal generator having a deviation of at least 200 KHz with a sweep rate of 60 Hertz, as well as an oscilloscope. During the IF and ratio detector alignment it is not only necessary to obtain maximum gain, but also extremely important to maintain symmetry.

To help achieve this IF curve symmetry 10.6 and 10.8 megahertz markers must be symmetrically positioned and the 10.7 megaher tz marker must be at the center of the curve. When aligning the ratio detector, 10.5 and 10.9 megahertz markers are desirable to achieve S curve symmetry. The pattern illustrating marker use to obtain S curve symmetry indicates it is most necessary to adjust for maximum gain and at the same time maintain linearity and symmetry. 10.7 megahertz must be on the curve at the reference line. 10.5 megahertz and 10.9 megahertz must be at the lower and upper turn of the S curve respectively. Only when the I.F. and ratio detector circuitry have been aligned in accordance with these specifications should the technician proceed to align the multiplex portion of the receiver.

Preliminary Procedures

Before using the Zenith FM multiplex signal generator, it is recommended that it be connected to the power source and turned on giving it a 10 to 20 minute warmup period. This will allow ample time for the RF, audio, and 19KHz oscillators to stabilize.

The following procedure is only necessary when the generator has been received from the factory, or has been subjected to a great deal of handling or transportation vibration. Although the 19KHz pilot generator oscillator is extremely stable, there is always the possibility that it could shift from its precisely assigned frequency. As a result, we have a very simple method to check the 19KHz pilot frequency using an FM multiplex receiver and FM multiplex station as a frequency standard. Proceed as follows:

1. Tune your FM multiplex receiver to an FM multiplex station and when the pilot indicator lights up, this indicates the 19KHz pilot amplifier is functioning. Since the 19KHz sine wave is from the transmitter it must be on frequency and can be used as a reference standard. With a cable connect the collector output of the 19KHz amplifier to the vertical input of a good oscilloscope.

2. On the multiplex generator set the pilot carrier amplitude control to 10%. Place L-R, L+R and 67KHz switches in OFF position and connect the composite output terminal directly to the horizontal input of the oscilloscope. On the oscilloscope you will see an oval Lissajous figure which should be motionless when the 19KHz output of the generator is synchronized with the 19KHz signal from the transmitter. Should the Lissajous figure rotate it will only be necessary to adjust the pilot carrier frequency trimmer on the multiplex generator with an IF alignment wrench until the Lissajous figure ceases to rotate. After the generator has been adjusted to zero beat, disconnect all cable.

This multiplex generator provides a composite mulitplex signal as well as an RF signal, FM modulated by the composite multiplex signal. The composite signal is very useful since it is an excellent tool that can be used in signal tracing the multiplex portion of the receiver. We do not recommend that multiplex alignment be made using only the composite signal injected at the output terminal of the ratio detector tertiary winding, since there is always some phase shift occurring in the RF, IF or ratio detector circuits. As a result, multiplex alignment made by a signal injected at the ratio detector would not be correct. For proper multiplex alignment the composite signal must FM modulate the RF carrier and then be fed into the FM antenna terminals. With the signal injected

in this manner the multiplex alignment would then be the best that could possibily be obtained and separation would be the maximum for this receiver.

The RF carrier in this generator is variable from 88 to 108MHz. The RF signal should be injected at a point in the FM band where no other signal is present. If at all possible this should be at a frequency near the middle of the FM band, Tune the FM receiver to this point and adjust the RF frequency adjusting slug on the generator to this same frequency. The AGC voltage developed in the receiver should be maximum. AGC voltage substantially less than this will indicate the RF frequency adjusting slug is tuned to an image.

19KHz Sub Carrier Amplifier, Doubler and Mute Adjustments

1. Turn generator 19KHz pilot carrier amplitude control to 10% position.
2. Connect the V.T.V.M. (DC scale) and/or scope to the junction of the two frequency doubling diodes and chassis (test point "N").
3. Place the stereo-monaural switch in stereo position and short Test Point "T" to ground.
4. Adjust the 19KHz amplifier transformer and the doubler transformer for maximum output. Simultaneously adjust the mute control so the voltage at the junction of the two frequency doubling diodes never exceeds -.2 volt during this operation. This voltage must be kept at a minimum for proper alignment. The three controls in this paragraph have an effect on each other. Should the stereo indicator light up, readjust the mute control to extinguish the lamp and continue adjustment of the transformers for maximum.
5. Remove ground from Test Point "T".
6. Turn generator pilot carrier amplitude control to 5% position.
7. Slowly rotate the mute control to a point where the stereo indicator lights up.

Separation Adjustments

1. Place stereo monaural switch in Stereo position.
2. Turn generator pilot carrier amplitude control to 10% position.
3. Move L-R and L+R generator switches from OFF position to L-R and L+R positions.
4. Connect a V.T.V.M. (AC scale) and/or scope to the L audio output, after the 38KHz filter.
5. Adjust the 38KHz detector transformer for maximum voltage at L output. The magnitude of this signal should be much greater than that at the R output. The voltage at the L output should be approximately 10 times or greater than at the R output.

TROUBLE-SHOOTING

Should a problem arise in aligning the FM multiplex portion of the receiver and the technician does not know whether the difficulty lies in the RF, IF, limiter and ratio detector portions of the receiver, or whether the difficulty lies in the multiplex portion, the multiplex generator can be used as an excellent signal tracing device to determine if the multiplex section of the receiver is functioning properly. The composite output of the multiplex generator can be injected at the output of the ratio detector.

To reduce possible extraneous signals coming through the ratio detector, short the ratio detector primary with a jumper lead. The wave froms and their magnitude may vary slightly from chassis to chassis, however, they are quire indictive of what will be seen when signal tracing the multiplex circuitry.

67KHz Signal Tracing

1. Turn generator pilot carrier amplitude control to zero.
2. Move L+R and L-R switches to OFF position.
3. Move 67 KHz generator switch from OFF position up to 67KHz. Sequentially connect an oscilloscope to the input and output of the 67KHz trap. The 67KHz signal at the output of the trap if it is properly nulled, will be much smaller than at the input. The voltage ratio should be approximately 20 to 1 input to output.

19KHz Signal Traccing

1. Move the 67KHz generator switch to OFF.
2. Rotate the generator 19KHz pilot carrier amplitude control to 10% position.
3. Sequentially connect your scope to the base of composite amplifier, base of 19KHz amplifier and collector of 19KHz amplifier. The amplitude of the 19KHz signal should greatly increase as you proceed along the 19KHz chain.

Doubler and Subcarrier Signal Tracing

To determine if the doubler is functioning, place your scope at the junction of the two diodes and you will see 38KHz DC pulses. Placing the scope at the collector of the subcarrier amplifier, you should see a 38KHz sine wave which will indicate that the subcarrier amplifier and associated ringing circuitry is functioning properly.

Multiplex Detector Signal Tracing

1. Leave the 19KHz amplitude control at 10%.
2. Move the L - R generator switch from OFF position to L - R position. You should see equal amplitude 1000 hertz sine waves at both L and R outputs.
3. Move the L+R switch from OFF up to L+R and look at the L audio output, and measure the magnitude of the 1000 Hertz sine wave. If the multiplex detector and preceeding circuitry are aligned properly, the magnitude of the wave form at L should be greater than at R.

If all the waves are similar in form and magnitude to those indicated, then it can be assumed that the multiplex portion of the receiver is functioning properly and the problem lies ahead of this in the FM receiver. If any of the wave forms are missing at a latter point but are apparent at a previous point, then something is amiss in the circuitry between the two test points.

PARTS LIST

NOTE: Certain circuit boards included in this parts list have component locations identified by item number on the circuit board. These item numbers are also shown on the schematic and in the following parts list – See HF 18 for more information.

ITEM NO.	PART NO.	DESCRIPTION
		CHASSIS 3AT20
C401	22-3414	.0047 MFD Disc 25V
C402	22-2	220 PF Disc 500V
C403	22-3652	.1 MFD Disc 10V
C404	22-3255	330 PF Disc 25V
C405	22-4568	100 MFD Electrolytic 15V
C406	22-4570	100 MFD Electrolytic 35V
C501	22-3767	500 MFD Electrolytic 35V
R401	*63-8321	5 MEG Ohm Volume Control
R402	63-1883	220K Ohms 10% ½W
R403	63-1820	6800 Ohms 10% ½W
R404	63-1890	330K Ohms 10% ½W
R405	63-1915	1.2 MEG Ohm 10% ½W
R406	63-1785	1K Ohms 10% ½W
R407	63-1785	1K Ohms 10% ½W
R408	63-1747	120 Ohms 10% ½W
R409	63-1701	10 Ohms 10% ½W
CR401	103-145	Bias Diode
CR501	212-71	Rectifier
LS401	49-1184	Speaker (6¼ x 2¼)
	*12-5331	Chassis Support Bracket
	64-1033	Rip Eyelet (7 Required)
	86-329	Connector Terminal
	*121-764	Driver Transistor
	800-305	Output Transistor Assembly-Matched Pair (NPN-PNP).
		CHASSIS 25AT20
C101A	22-4808	A.M. Antenna Trimmer
C101B		A.M. Antenna Tuner
C101C		A.M. Detector Tuner
C101D		A.M. Detector Trimmer
C101E		A.M. Oscillator Trimmer
C101F		A.M. Oscillator Tuner
C102	22-5	100 PF Disc 500V
C103	22-14	.0047 MFD Disc 500V
C104	22-3034	.05 MFD Disc 25V
C105	22-3034	.05 MFD Disc 25V
C106	22-5639	.22 MFD Capacitor 100V
C107	22-2729	.001 MFD Disc 25V
C108	22-3034	.05 MFD Disc 25V
C109	22-3254	.1 MFD Disc 25V
C110	22-4564	10 MFD Electrolytic 25V
C111	22-4568	100 MFD Electrolytic 15V
C201	22-2720	1.0 PF Gimmick 500V
C202	22-3254	.1 MFD Disc 25V
C203	22-2715	1.2 PF Gimmick 500V
C204	22-3034	.05 MFD Disc 25V
C205	22-3034	.05 MFD Disc 25V
C206	22-3254	.1 MFD Disc 25V
C207	22-3675	10 PF Disc 500V
C208	22-3034	.05 MFD Disc 25V
C209	22-3034	.05 MFD Disc 25V
C210	22-2884	5 MFD Electrolytic 12V
C211	22-3034	.05 MFD Disc 25V
C212	22-2903	22 PF Disc 500V
C213	22-3034	.05 MFD Disc 25V
C214	22-2424	1.5 MFD Gimmick 500V
C215	22-3034	.05 MFD Disc 25V
C216	22-18	.0022 MFD Disc 500V
C217	22-18	.0022 MFD Disc 500V
C218	22-18	.0022 MFD Disc 500V
C219	22-5459	.0015 MFD Disc 500V
C220	22-3034	.05 MFD Disc 25V
C221	22-3034	.05 MFD Disc 25V
C222	22-3034	.05 MFD Disc 25V

ITEM NO.	PART NO.	DESCRIPTION
C223	22-2333	2.2 PF Gimmick 500V
C224	22-2729	.001 MFD Disc 25V
C225	22-3177	390 PF Disc 500V
C226	22-3177	390 PF Disc 500V
C227	22-3448	10 MFD Electrolytic 15V
C228	22-2374	6 PF Disc 500V
C229	22-3254	.1 MFD Disc 25V
C230	22-3080	.005 MFD Disc 25V
C231	22-2481	8 PF Disc 500V
C232	22-3034	.05 MFD Disc 25V
C301	22-3034	.05 MFD Disc 25V
C302	22-5780	270 PF Capacitor 5% 500V
C303	22-5781	.001 MFD Capacitor 5% 500V
C304	22-5018	.47 MFD Capacitor 50V
C305	22-5782	2200 PF Capacitor 5% 500V
C306	22-2884	5 MFD Electrolytic 12V
C307	22-5782	2200 PF Capacitor 5% 500V
C308	22-3393	.01 MFD Disc 25V
C309	22-5781	.001 MFD Capacitor 5% 500V
C310	22-3415	.0068 MFD Disc 25V
C311	22-2884	5 MFD Electrolytic 12V
C312	22-5761	470 PF Disc 500V
C362	22-5761	470 PF Disc 500V
C401	22-3034	.05 MFD Disc 25V
C402	*22-6042	.82 MFD Disc 3V
	OR	
C402	22-5944	.82 MFD Disc 3V
C403	22-2884	5 MFD Electrolytic 12V
C404	*22-5911	.27 MFD Capacitor 100V
C405	*22-5900	.56 MFD Capacitor 100V
C406	22-3595	.33 MFD Capacitor 50V
C407	22-5542	.0022 MFD Capacitor 500V
C408	22-3892	.01 MFD Capacitor 100V
C409	22-5159	.047 MFD Capacitor 50V
C410	*22-5867	.12 MFD Capacitor 100V
C411	22-4905	.01 MFD Capacitor Disc 500V
C412	22-3255	330 PF Disc 500V
C413	22-5188	.1 MFD Capacitor 50V
C414	22-5413	.0033 MFD Disc 500V
C417	22-4576	25 MFD Electrolytic 15V
C419	22-3608	68 PF Disc 500V
C421	22-5362	1000 MFD Electrolytic 50V
C423	22-3362	560 PF Disc 500V
C424	22-3034	.05 MFD Disc 25V
C451	22-14	.0047 MFD Disc 500V
C452	22-6042	.82 MFD Disc 3V
	OR	
C452	22-5944	.82 MFD Disc 3V
C453	22-2884	5 MFD Electrolytic 12V
C454	*22-5911	.27 MFD Capacitor 100V
C455	*22-5900	.56 MFD Capacitor 100V
C456	22-3595	.33 MFD Capacitor 50V
C457	22-5542	.0022 MFD Capacitor 500V
C458	22-3892	.01 MFD Capacitor 100V
C459	22-5159	.047 MFD Capacitor 50V
C460	*22-5867	.12 MFD Capacitor 100V
C461	22-4905	.01 MFD Capacitor Disc 500V
C462	22-3255	330 PF Disc 500V
C463	22-5188	.1 MFD Capacitor 50V
C464	22-13	.0033 MFD Disc Capacitor 500V
C467	22-4576	25 MFD Electrolytic 15V
C469	22-3608	68 PF Disc 500V
C471	22-5362	1000 MFD Electrolytic 50V
C473	22-3362	560 PF Disc 500V
C474	22-3034	.05 MFD Disc 25V
C501	22-4121	.047 MFD Capacitor 200V
C502	22-4121	.047 MFD Capacitor 200V

*Denotes parts not previously used.

ITEM NO.	PART NO.	DESCRIPTION
C504	22-5362	1000 MFD Electrolytic 50V
C505	22-5316	500 MFD Electorlytic 50V
C506	22-5474	2000 MFD Electrolytic 30V
C508	22-5167	1000 MFD Electrolytic 30V
C509	22-5192	300 MFD Electrolytic 15V
C510	22-5903	.0015 MFD Disc 1.4KV
C511	22-4147	.1 MFD Capacitor 400V
C512	22-4147	.1 MFD Capacitor 400V
C513	22-4147	.1 MFD Capacitor 400V
R101	63-1792	1.5K Ohm Resistor 10% ½W
R102	63-1764	330 Ohm Resistor 10% ½W
R103	63-1761	270 Ohm Resistor 10% ½W
R104	63-1764	330 Ohm Resistor 10% ½W
R105	63-1817	5.6K Ohm Resistor 10% ½W
R106	63-1834	15K Ohm Resistor 10% ½W
R107	63-1813	4.7K Ohm Resistor 10% ½W
R108	63-1785	1K Ohm Resistor 10% ½W
R109	63-1785	1K Ohm Resistor 10% ½W
R110	63-1915	1.2 Meg Ohm Resistor 10% ½W
R201	63-1768	390 Ohm Resistor 10% ½W
R202	63-1782	820 Ohm Resistor 10% ½W
R203	63-1764	330 Ohm Resistor 10% ½W
R204	63-1778	680 Ohm Resistor 10% ½W
R205	63-1803	2.7K Ohm Resistor 10% ½W
R206	63-1831	12K Ohm Resistor 10% ½W
R207	63-1771	470 Ohm Resistor 10% ½W
R208	63-1838	18K Ohm Resistor 10% ½W
R209	63-1810	3.9K Ohm Resistor 10% ½W
R210	63-1834	15K Ohm Resistor 10% ½W
R211	63-1799	2.2K Ohm Resistor 10% ½W
R212	63-1834	15K Ohm Resistor 10% ½W
R213	*63-8258	150K Potentiometer
R214	63-1785	1K Ohm Resistor 10% ½W
R215	63-1740	82 Ohm Resistor 10% ½W
R216	63-1792	1.5K Ohm Resistor 10% ½W
R217	63-1743	100 Ohm Resistor 10% ½W
R218	63-1785	1K Ohm Resistor 10% ½W
R219	63-1778	680 Ohm Resistor 10% ½W
R220	63-1778	680 Ohm Resistor 10% ½W
R221	63-1848	33K Ohm Resistor 10% ½W
R222	63-1890	330K Ohm Resistor 10% ½W
R223	63-1897	470K Ohm Resistor 10% ½W
R224	63-1883	220K Ohm Resistor 10% ½W
R225	63-1831	12K Ohm Resistor 10% ½W
R226	63-1806	3.3K Ohm Resistor 10% ½W
R227	63-1778	680 Ohm Resistor 10% ½W
R228	63-1785	1K Ohm Resistor 10% ½W
R229	63-1701	10 Ohm Resistor 10% ½W
R230	63-1778	680 Ohm Resistor 10% ½W
R231	63-1778	680 Ohm Resistor 10% ½W
R232	63-1817	5.6K Ohm Resistor 10% ½W
R233	63-1813	4.7K Ohm Resistor 10% ½W
R234	63-1869	100K Ohm Resistor 10% ½W
R235	63-1869	100K Ohm Resistor 10% ½W
R236	63-1848	33K Ohm Resistor 10% ½W
R237	63-1785	1K Ohm Resistor 10% ½W
R238	63-1796	1.8K Ohm Resistor 10% ½W
R301	63-1911	1 Meg Ohm Resistor 10% ½W
R302	63-1855	47K Ohm Resistor 10% ½W
R303	63-1817	5.6K Ohm Resistor 10% ½W
R304	63-1764	330 Ohm Resistor 10% ½W
R305	63-1813	4.7K Ohm Resistor 10% ½W
R306	63-1764	330 Ohm Resistor 10% ½W
R307	63-1806	3.3K Ohm Resistor 10% ½W
R308	63-6495	100K Ohm Potentiometer
R309	63-1782	820 Ohm Resistor 10% ½W
R310	63-1771	470 Ohm Resistor 10% ½W
R311	63-1824	8.2K Ohm Resistor 10% ½W
R312	63-1775	560 Ohm Resistor 10% ½W
R313	63-1771	470 Ohm Resistor 10% ½W
R314	63-1771	470 Ohm Resistor 10% ½W
R315	63-1825	9.1K Ohm Resistor 5% ½W
R316	63-1826	10K Ohm Resistor 5% ½W
R317	63-1789	1.2K Ohm Resistor 10% ½W
R318	63-1771	470 Ohm Resistor 10% ½W
R401	63-1852	39K Ohm Resistor 10% ½W
R402	63-1876	150K Ohm Resistor 10% ½W
R403	63-1890	330K Ohm Resistor 10% ½W
R404	63-1848	23K Ohm Resistor 10% ½W
R405	63-1827	10K Ohm Resistor 10% ½W
R406	63-1782	820 Ohm Resistor 10% ½W
R407	63-1775	560 Ohm Resistor 10% ½W
R408	*63-8237	30K Volume Control
R409	63-1838	18K Ohm Resistor 10% ½W
R410	*63-8239	250K Bass Control
R411	63-1820	6.8K Ohm Resistor 10% ½W
R412	*63-8238	10K Treble Control
R413	63-1848	33K Ohm Resistor 10% ½W
R414	63-1939	4.7 MEG Ohm Resistor 10% ½W
R416	63-1740	82 Ohm Resistor 10% ½W
R417	63-1841	22K Ohm Resistor 10% ½W
R418	63-1771	470 Ohm Resistor 10% ½W
R419	63-1876	150K Ohm Resistor 10% ½W
R420	63-6045	270 Ohm Resistor 10% 1W
R421	63-4519	2.7 Ohm Resistor 10% ½W
R422	63-5656	470 Ohm Resistor 10% 2W
R423	63-4519	2.7 Ohm Resistor 10% ½W
R424	63-1852	39K Ohm Resistor 10% ½W
R425	63-5305	.51 Ohm Resistor 5% 5W
R426	63-5305	.51 Ohm Resistor 5% 5W
R427	63-1845	27K Ohm Resistor 10% ½W
R428	*63-8240	150K Ohm Balance Control
R429	63-1925	2.2 Meg Ohm Resistor 10% ½W
R430	63-1894	390K Ohm Resistor 10% ½W
R431	63-6027	100 Ohm Resistor 10% 1W
R435	63-1939	4.7 Meg Ohm Resistor 10% ½W
R451	63-1852	39K Ohm Resistor 10% ½W
R452	63-1876	150K Ohm Resistor 10% ½W
R453	63-1890	330K Ohm Resistor 10% ½W
R454	63-1848	33K Ohm Resistor 10% ½W
R455	63-1827	10K Ohm Resistor 10% ½W
R456	63-1782	820 Ohm Resistor 10% ½W
R457	63-1775	560 Ohm Resistor 10% ½W
R458	63-8237	30K Volume Control
R459	63-1838	18K Ohm Resistor 10% ½W
R460	63-8239	250K Ohm Bass Control
R461	63-1820	6.8K Ohm Resistor 10% ½W
R462	63-8238	10K Ohm Treble Control
R463	63-1848	33K Ohm Resistor 10% ½W
R464	63-1939	4.7 MEG Ohm Resistor 10% ½W
R466	63-1740	82 Ohm Resistor 10% ½W
R467	63-1821	22K Ohm Resistor 10% ½W
R468	63-1771	470 Ohm Resistor 10% ½W
R469	63-1876	150K Ohm Resistor 10% ½W
R470	63-6045	270 Ohm Resistor 10% 1W
R471	63-4519	2.7 Ohm Resistor 10% ½W
R472	63-5656	470 Ohm Resistor 10% 2W
R473	63-4519	2.7 Ohm Resistor 10% ½W
R474	63-1852	39K Ohm Resistor 10% ½W
R475	63-6305	.51 Ohm Resistor 5% 5W
R476	63-6305	.51 Ohm Resistor 5% 5W
R480	63-1894	390K Ohm Resistor
R481	63-6027	100 Ohm Resistor 1W
R483	63-4548	22 MEG Ohm Resistor 10% ½W
R484	63-4548	22 MEG Ohm Resistor 10% ½W
R485	63-1939	4.7 MEG Ohm Resistor 10% ½W
R501	63-1926	2.2 MEG Ohm Resistor 20% ½W
R502	63-5652	390 Ohm Resistor 10% 2W
R503	63-5663	680 Ohm Resistor 10% 2W
R504	63-1757	220 Ohm Resistor 10% ½W
R505	63-5628	100 Ohm Resistor 10% 2W
R506	63-7576	50 Ohm Resistor 10% 4W
L101	S-64803	AM Loop Antenna
L102	In T104	1st IF Transformer (AM) Primary
L103	In T104	1st IF Transformer (AM) Secondary
L201	20-2033	Peaking Coil

*Denotes parts not previously used.

ITEM NO.	PART NO.	DESCRIPTION
L202	20-142 2	Peaking Coil
L203	In T20 1	2nd IF Transformer (FM) Primary
L204	In T20 1	2nd IF Transformer (FM) Secondary
L205	In T20 2	2nd IF Transformer (AM) Primary
L206	In T20 2	2nd IF Transformer (AM) Secondary
L207	In T20 3	3rd IF Transformer (FM) Primary
L208	In T20 3	3rd IF Transformer (FM) Secondary
L209	In T20 4	3rd IF Transformer (AM) Primary
L210	In T20 4	3rd IF Transformer (AM) Secondary
L211	In T20 5	4th IF Transformer (FM) Primary
L212	In T20 5	4th IF Transformer (FM) Secondary
L213	In T20 6	Ratio Detector Transformer Primary
L214	In T20 6	Ratio Detector Transformer Secondary
L215	In T20 6	Ratio Detector Transformer Tertiary
L301	S-7943 5	MX Trap Coil
T13	95-269 9	Driver Transformer
T14	95-269 9	Driver Transformer
T101	S-7447 0	AM Antenna Coil
T102	*95-271 6	AM Detector Coil
T103	*95-271 7	AM Oscillator Coil
T104	*95-271 8	1st AM IF
T201	*95-272 8	1st FM IF
T202	*95-271 9	2nd AM IF
T203	*95-272 6	3rd FM IF
T204	*95-272 0	3rd AM IF
T205	*95-272 6	4th FM IF
T206	*95-272 7	Ratio Detector
T301	S-7943 8	MX Input Coil
T302	S-7943 6	MX Doubler Coil
T304	*S-8418 1	MX Bi-Plex Detector Coil
T501	95-273 5	Power Transformer
CR101	103-23	Diode
CR201	103-23	Diode
CR203	103-23	Diode
CR204	103-23	Diode
CR205	103-23	Diode
CR301	103-23	Diode
CR302	103-23	Diode
CR502	212-61	Diode
CR503	212-61	Diode
CR504	103-96	Diode (Zener)
Z201	20-200 8	10.7 MHZ Choke
Z301	*105-10 7	38 KHZ Filter (Right)
Z351	*105-10 7	38 KHZ Filter (Left)
P501	On 11- 106	AC Line Cord Plug
P502	43-519	AC Phono Motor Input
P503	43-574	9 Contact Housing (Female)
P504	43-840	3 Contact Housing (Female)
P505	43-571	9 Contact Housing (Male)
P506	43-877	3 Contact Housing (Male)
P507	43-877	3 Contact Housing (Male)
P508	43-840	3 Contact Housing (Female)
DS1	100-48 2	Stereo Indicator
DS2	100-24-9	Pilot Light No. 1847 (Cabinet)
DS3	100-24-9	Pilot Light No. 1847 (Cabinet)
DS4	100-24-9	Pilot Light No. 1847
DS5	100-24-9	Pilot Light No. 1847
DS6	100-24-9	Pilot Light No. 1847
DS7	100-24-9	Pilot Light No. 1847
DS8	100-24-9	Pilot Light No. 1847
DS9	100-24-9	Pilot Light No. 1847
DS10	100-24-9	Pilot Light No. 1847
DS11	100-24-9	Pilot Light No. 1847
DS12	100-42 2	Function Light No. 1030 (Stereo)
DS13	100-42 2	Function Light No. 1030 (Phono)
DS14	100-42 2	Function Light No. 1030 (Tape)
DS15	100-42 2	Function Light No. 1030 (AM)
DS16	100-42 2	Function Light No. 1030 (AFC)
DS17	100-42 2	Function Light No. 1030 (FM)
SW1	*85-107 0	Bandswitch
SW2	*85-107 2	Stereo-Mono Switch
SW3	*85-107 1	On-Off Switch
M201	*122-41	Tuning Meter
F501	136-24	Fuse

ITEM NO.	PART NO.	DESCRIPTION
	*12-5214	Rear Chassis Support Bracket
	*12-5216	Light Shield Strip
	*26-1811	Dial Scale
	*43-1103	Function Plate Housing
	*43-1109	6 Contact Housing (4 required)
	*46-7249	Control Knob - Loudness, - Treble, - Balance & Bass (4 required)
	46-7334	Tuning & Function Knob (2 required)
	*46-7355	Stereo - Monaural & On-Off Knob (2 req.)
	54-541	Thread - Forming Palnut (3 used on 12-5216 & 2 used on ea. 57-7421 & 57-7422) (11 req.)
	*54-506	Tinnerman Speed Nut (2 used on ea. 83-7206 & 126-1410) (20 required)
	*54-833	Tinnerman Speed Nut (6 used on 192-467) (6 required)
	*54-834	Thread - Forming Palnut (1 joins 43-1103 & Escutcheon)
	*57-7257	Die-Cast Escutcheon
	*57-7421	Slide Switch Mounting Plate
	*57-7422	Slide Switch Mounting Plate
	*57-7499	Retainer Plate (4 required)
	*83-7206	Slider Guide
	*83-7208	Trim Strip (Bottom)
	*83-7209	Trim Strip (Top)
	*83-7210	Indicator Strip (Volume)
	*83-7211	Indicator Strip (Treble)
	*83-7212	Indicator Strip (Balance)
	*83-7213	Indicator Strip (Bass)
	*86-538	Connector Terminal (21 required)
	*112-625	4-25 x 1/4 Phillips Pan Hd. Self-Tap. Screw-Stat. Bronze (2 used on ea. 63-8237, 63-8238, 63-8239 & 63-8240) (8 required)
	114-344	6-20 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (4 used on 43-1103)
	114-801	8-18 x 5/16 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (4 join escutcheon & RF Chassis)
	114-806	8-18 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (4 joins audio chassis & RF chassis & 2 used on 12-5214) (6 required)
	*126-1410	Light Shield (2 required)
	*126-1416	Slider Guide Shield (8 required)
	188-441	Knob Clamping Ring (Part of 46-7334)
	*192-467	Dial Crystal

25AT20 R.F. CHASSIS COMPONENTS

12-4211	Variable Capacitor Mounting Bracket
*12-5192	Meter Mounting Bracket
*12-5193	Chassis Mounting Bracket
*12-5232	Switch Bracket
19-448	Grounding Clip (2 required)
19-464	Coil Mounting Clip
19-480	Wire Retaining Clip
19-485	Cable Clamp
19-492	Wire Retaining Clip (5 required)
43-571	Nine Contact Housing
43-877	Three Contact Housing
52-1496	Two Conductor Shielded Cable
*52-1622	Two Conductor Cable
*52-1624	Two Conductor Shielded Cable
*52-1625	Two Conductor Shielded Cable
*52-1626	Two Conductor Shielded Cable
54-139	3/8 - 32 x 9/16 Palnut - Cadmium (Used on 85-1070)
54-812	Tinnerman Speed Nut (13 used on chassis & 3 used on 126-1429)
*54-832	Tinnerman Speed Nut (2 used on 12-5192)
*57-7256	Back Ground Plate
57-7452	Function Plate & Socket
58-315	Connector Plug (2 part of S-83447 & 1 part of S-83450)
*59-1036	Dial Pointer
61-222	Pulley (2 part of S-83474 & 2 part of S-83475)
64-862	Steel Eyelet (4 used on FM Tuner)

*Denotes parts not previously used.

ITEM NO.	PART NO.	DESCRIPTION
	69-217	4-40 x 3/16 Rd. Hd. Machine Screw-N.P. (2 used on ea. 85-1071 & 85-1072) (4 required)
	*78-1891	Socket & Wire (3 required)
	*78-1892	Socket & Wire (2 required)
	*78-1901	Socket & Wire (3 required)
	80-209	Tension Spring
	80-1140	Tension Spring
	*83-7308	Terminal Strip
	*83-7309	Antenna Terminal Strip
	86-388	Connector Terminal (2 required)
	86-390	Connector Terminal (8 required)
	86-398	Connector Terminal (6 required)
	86-483	Connector Terminal (3 required)
	86-500	Terminal (Test Point) (24 required)
	113-10	6-32 x 3/16 x 1/4 Hex Hd. Mach. Screw-N.P. - Internal Shakeproof Lockwasher (2 join 12-4211 & 22-4808)
	114-344	6-20 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw Stat. Bronze (3 used on 57-7256, 2 join 126-1420 & 57-7256, 2 used on S-83475 & 1 used on 85-1070 & 2 Mt. 126-1420)
	114-494	10-16 x 1/2 Hex Hd. Self-Tap. Screw-Stat. Bronze - Flat Washer Att. (4 used on FM tuner)
	114-801	8-18 x 5/16 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (2 used on 12-4211)
	114-806	8-18 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (2 used on ea. 83-7309 & 85-1071 & 3 used on ea. S-83474 & 12-5193) (10 required)
	121-496	Transistor - Comp. Amp. - 19KHZ Amp. - 38KHZ Amp. - Stereo Ind. Sw. (4 required)
	121-546	Transistor - 2nd. & 3rd. I.F. (3 required)
	121-614	Transistor - 1st I.F.
	121-638	Transistor - Converter
	*121-734	Transistor
	*121-753	Transistor (2 required)
	125-117	Rubber Grommet (4 used on FM tuner)
	126-1331	Coil Shield
	126-1420	Dial Scale Light Shield
	*126-1429	Bandswitch Shield
	149-370	Iron Core
	199-246	Insulating Sleeve (2 part of S-83449)
	S-82931	FM tuner assembly
	*S-83447	Phono Cable & Connector Plug Assem.
	*S-83449	Shielded Cable & Terminal Assem. (tape in)
	*S-83450	FM Cable & Plug Assem.
	*S-83454	Stereo Indicator, Wire & Terminal Assem.
	*S-83474	Chassis Mounting Bracket & Pulley Assem.
	*S-83475	Pointer Guide Rail & Pulley Assem.
	*S-83476	Drive Cord & Eyelet Assem.
	*S-83477	Drive Cord & Eyelet Assem.
	*S-83478	Drive Cord & Eyelet Assem.

25AT20 AUDIO CHASSIS COMPONENTS

	17-141	Cable Clamp
	19-448	Ground Clamp
	19-480	Wire Clip (2 required)
	19-546	Capacitor Retaining Clip (4 required)
	19-561	Capacitor Retaining Clip
	43-841	Three Contact Housing
	43-876	Three Contact Housing
	54-812	Tinnerman Speed Nut (4 used on ea. 64-1033 & 86-500)
	64-1033	Grip Eyelet (4 required)
	78-1812	Two Contact Transistor Socket (2 part of ea. S-73214)
	79-174-12	No. 18 Sleeving - Yellow - 1½"
	83-5277	Transistor Insulating Strip (2 part of ea. 800-196)
	83-5288	13 Lug Terminal Strip
	83-5794	18 Lug Terminal Strip
	86-344	Connector Terminal (3 part of S-83439)
	86-388	Connector Terminal (2 part of S-83440)
	86-390	Connector Terminal (2 required)
	86-484	Connector Terminal (3 required)
	86-500	Connector Pin (4 required)
	*95-2699	Driver Transformer (2 required)
	114-26	8-18 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (1 used on 17-141)
	114-271	6-20 x 1/2 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (4 used on ea. 800-196)
	114-344	6-20 x 1/4 x 1/4 Hex Hd. Self-Tap. Screw-Stat. Bronze (4 used on ea. S-73214 & 2 used on ea. 95-2699)
	121-706	Transistor - Driver (2 required)
	121-751	Transistor - Driver (2 required)
	*121-752	Transistor - Pre-Amp. (2 required)
	199-246	Insulating Sleeve (2 part of S-83440)
	199-319	Insulating Sleeve (2 part of S-83439)
	205-51	Dow Corning Heat Conductive Grease (Part of 800-196)
	800-196	Output Transistor Assem. - Matched Pr. (2 required)
	S-73214	Heat Sink & Socket Assem. (2 required)
	*S-83439	Speaker Cable, Terminal & Sleeve Assembly
	*S-83440	Two Conductor Shielded Cable, Terminal & Sleeve Assem.

S-82931 FM TUNER ASSEMBLY

C1	22-5318	34 PF Disc 5% 500V
C2	22-5164	1.2 PF Gimmick 5% 500V
C3	22-5318	34 PF Disc 5% 500V
C4	22-3675	10 PF Disc 5% 500V
C5	22-4613	.001 MFD Feed Thru 500V
C6	22-4718	.001 MFD Feed Thru 500V
C7	22-5318	34 PF Disc 5% 500V
C9	22-2614	15 PF Disc 5% 500V
C10	22-4613	.001 MFD Feed Thru 500V
C11	22-3479	2.2 PF Disc + .5% 500V
C12	22-3393	.01 MFD Disc 25V
C14	22-4613	.001 MFD Feed Thru 500V
C15	22-3393	.01 MFD Disc 25V
C16	22-2424	1.5 PF Gimmick 500V
C17	22-5281	23 PF Disc 5% 500V
C18	22-3393	.01 MFD Disc 25V
C19	22-2374	6 PF Disc + .5% 500V
C20	22-4613	.001 MFD Feed Thru 500V
C21	22-3393	.01 MFD Disc 25V
C22	22-4613	.001 MFD Feed Thru 500V
C23	22-4515	1.8 PF Gimmick 500V
L1	S-62887	FM Antenna Coil Assembly
L2	S-62887	FM RF Input Coil Assembly
L3	S-62887	FM Det. Coil Assembly
L4	20-1256	Trap Coil 10.7 MHZ
L5	In T1	
L6	In T1	
L7	S-62887	FM Oscillator Coil Assembly
SE1	103-47	Diode
T1	95-2322	1st FM - I.F. Tramsformer 10.7 MHZ
Q1	121-731	FM-RF Transistor
Q2	121-732	FM-Mixer Transistor
Q3	121-432	FM-Oscillator Transistor
	12-4192	Tuner Guide Bracket
	12-4193	Coil Mtg. Bracket
	19-322	Coil Mtg. Clip (4 required)
	24-1372	Tuner Cover
	44-48	Antenna Jack
	56-426	Roll Pin (6 required)
	57-5333	Bearing Plate
	63-1778	680 Ohm Resistor - ½W. 10%
	63-4122	33 Ohm Resistor - 1/4W. 10%
	63-4157	220 Ohm Resistor - 1/4W. 10%
	63-4171	470 Ohm Resistor - 1/4W. 10%
	63-4175	560 Ohm Resistor - 1/4W. 10%
	63-4185	1000 Ohm Resistor - 1/4W. 10%
	63-4199	2200 Ohm Resistor - 1/4W. 10%
	63-4210	3900 Ohm Resistor - 1/4W. 10%
	63-4227	10K Ohm Resistor - 1/4W. 10%

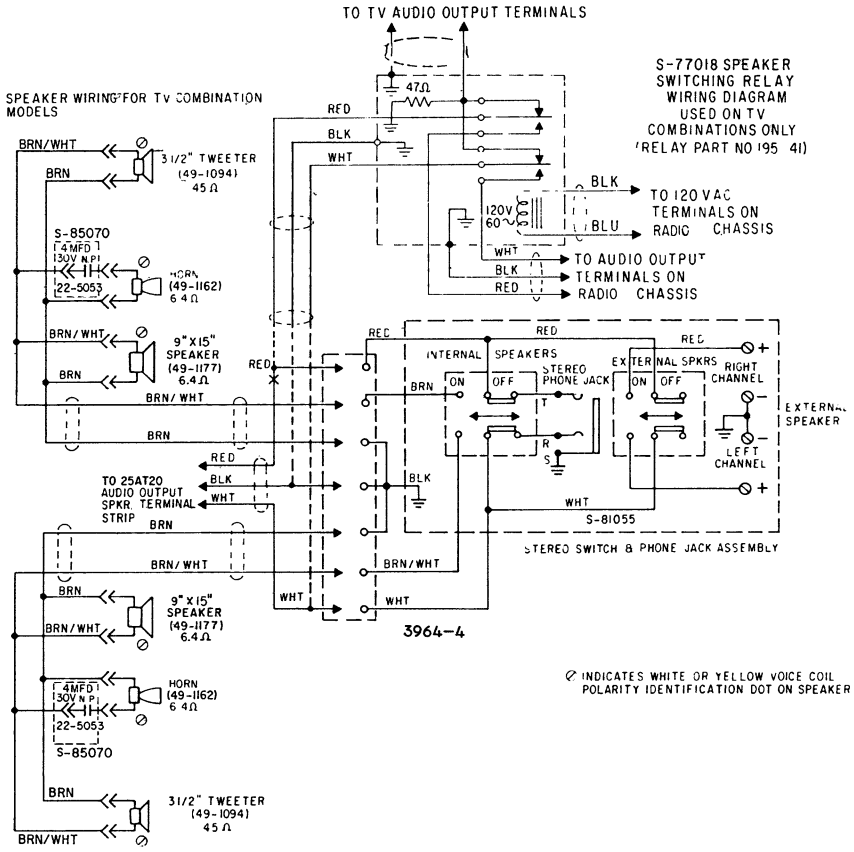
*Denotes parts not previously used.

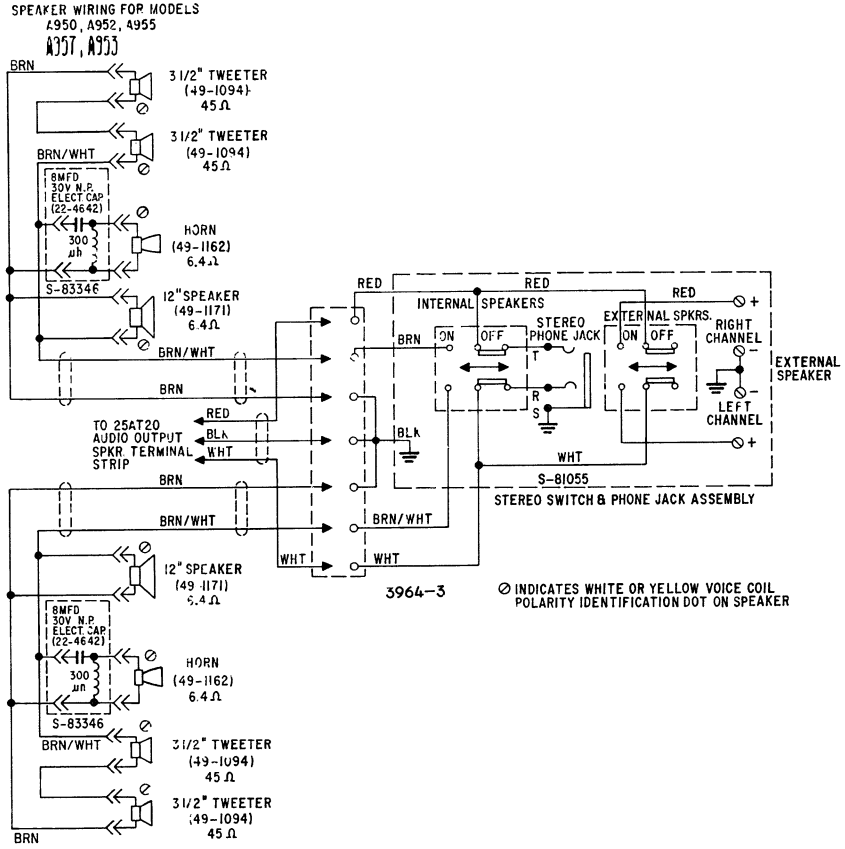
ITEM NO.	PART NO.	DESCRIPTION
	63-4241	22K Ohm Resistor - 1/4W. 10%
	63-4269	100K Ohm Resistor - 1/4W. 10%
	63-4283	220K Ohm Resistor - 1/4W. 10%
	63-4297	470K Ohm Resistor - 1/4W. 10%
	64-88	.088 Dia. x 1/8 Lg. Tubular Rivet-N.P.
	64-318	Brass Eyelet - USNC No. SE37 (6 required - used on S-83179 Only)
	76-1541	Guide Shaft (2 required)
	76-1820	Drive Shaft (Used on 12-4192, S-83179 only)
	76-1927	Drive Shaft (Used on 12-4192, S-82931 only)
	78-1227	Transistor Socket (2 required)
	78-1378	Transistor Socket
	79-174-12	No. 18 Sleeving - Yellow - 1½"
	80-1467	Shaft Retaining Spring
	80-1853	Transformer Retaining Spring
	83-3829	2 Lug Terminal Strip
	86-441	Insulated Feed-Thru Terminal (2 required)

ITEM NO.	PART NO.	DESCRIPTION
	94-613	Iron Core Bushing (4 required)
	94-1472	Tuning Shaft Bushing (Used on S-83179 only)
	94-1534	Tuning Shaft Bushing (Used on S-82931 only)
	113-26	6-32 x 1/4 x 1/4 Hex Hd. Mach. Screw-N.P. -Ext. Lockwasher Att. (2 used on ea. 12-4193 & 57-5333) (4 required)
	126-1141	Coil Shield - Side (2 required)
	126-1142	Coil Shield - Center
	149-368	Iron Core & Spring (3 required)
	149-385	Iron Coil & Spring
	188-232	Retaining Ring (4 required)
	S-69085	Shield & Terminal Strip Assem.
	S-83409	Detector Coil Assem.
	S-83410	Oscillator Coil Assem.
	S-83411	Antenna Coil Assem.
	S-83412	R.F. Input Coil Assem.
	S-83414	Bracket, Shaft & Pin Assem.

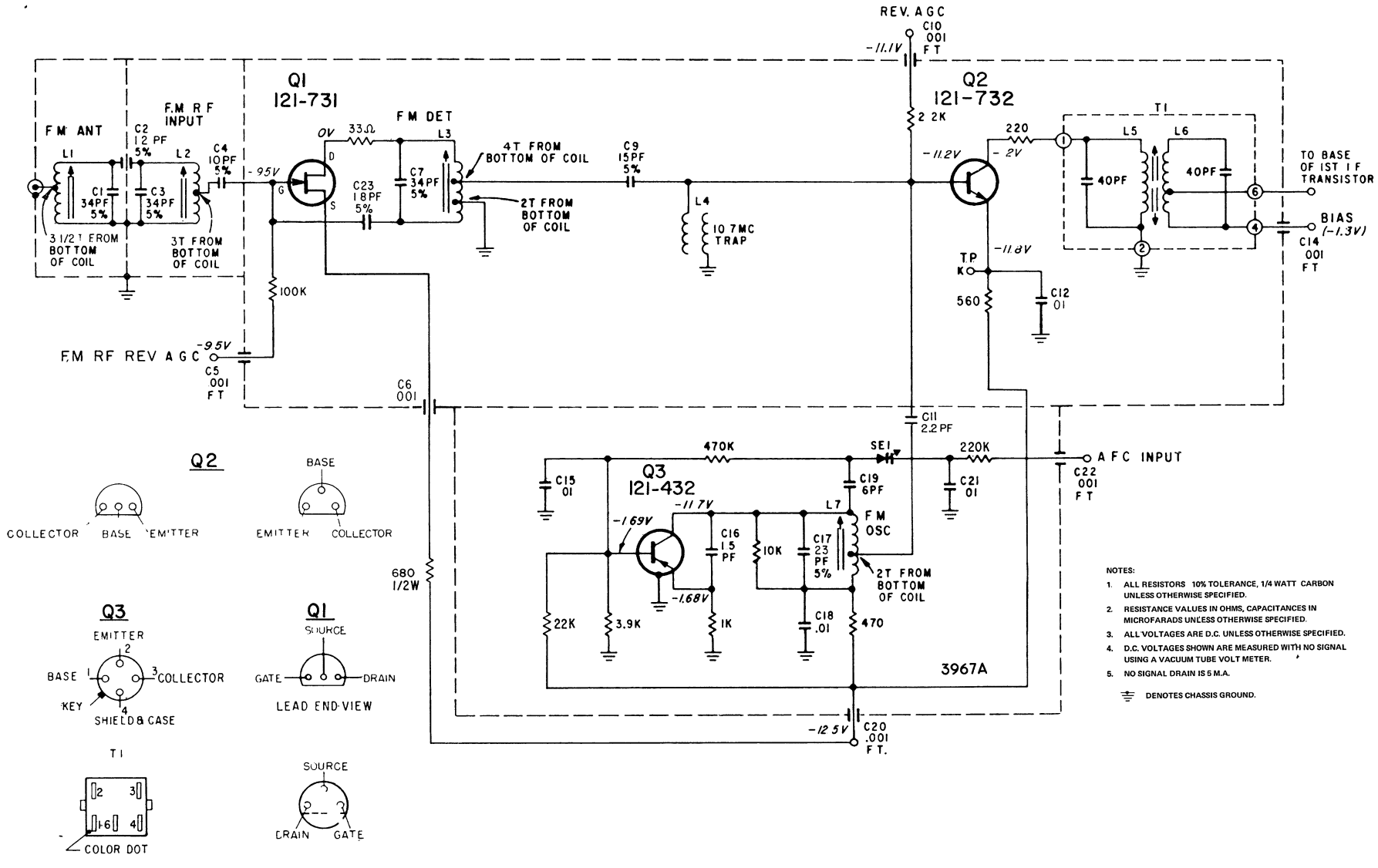
*Denotes parts not previously used.

NOTES





SPEAKER WIRING SCHEMATICS

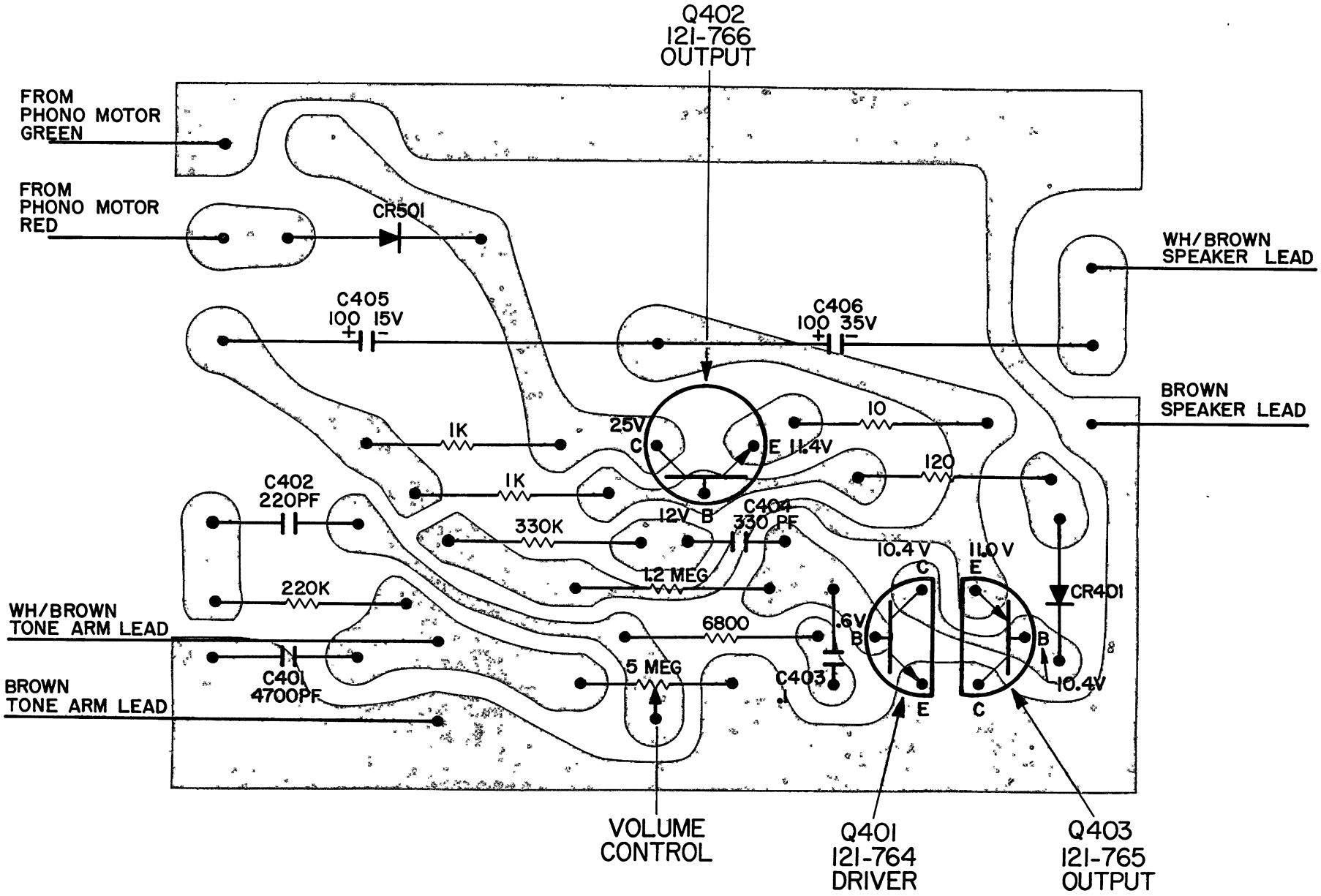


NOTES:

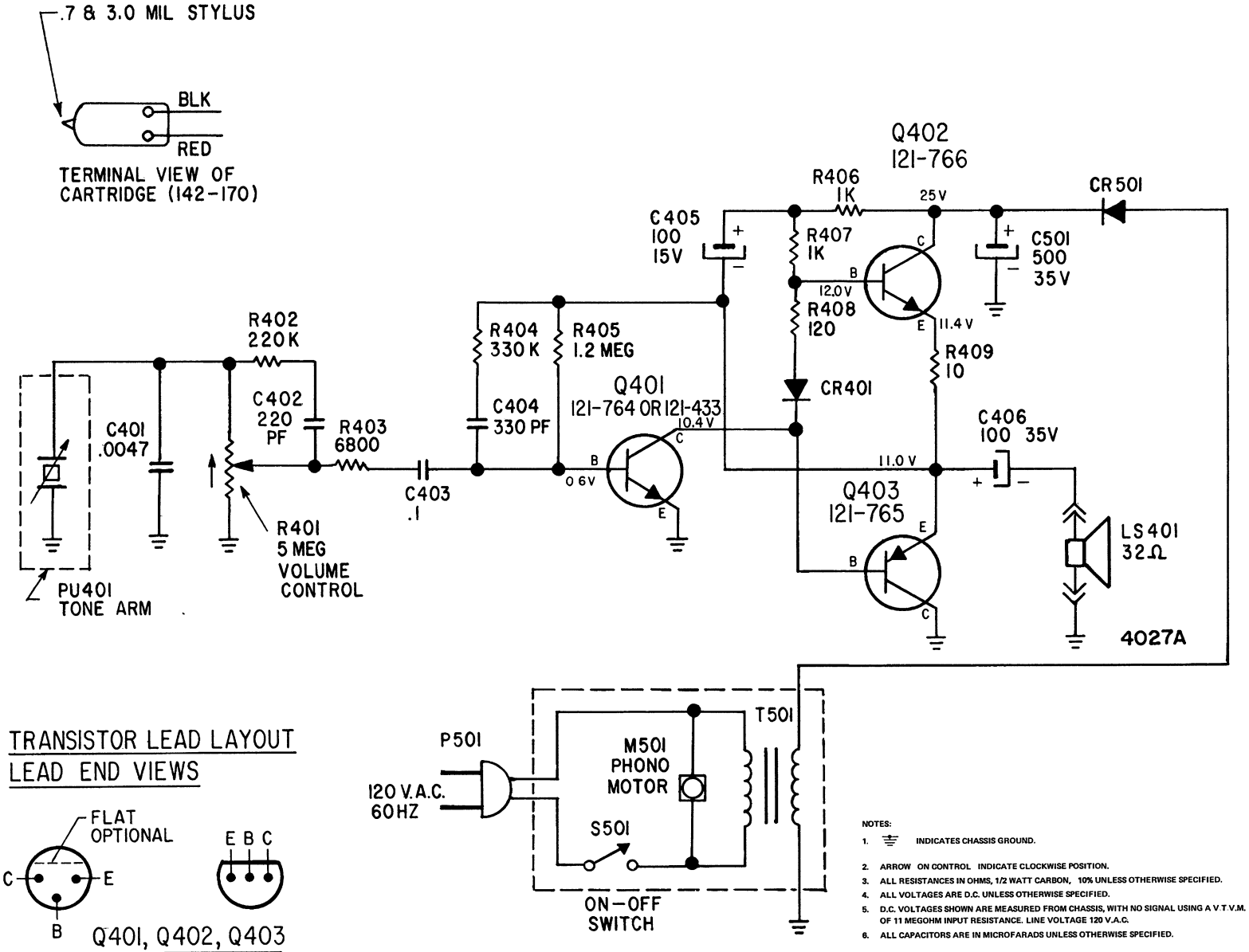
1. ALL RESISTORS 10% TOLERANCE, 1/4 WATT CARBON UNLESS OTHERWISE SPECIFIED.
2. RESISTANCE VALUES IN OHMS, CAPACITANCES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
3. ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
4. D.C. VOLTAGES SHOWN ARE MEASURED WITH NO SIGNAL USING A VACUUM TUBE VOLT METER.
5. NO SIGNAL DRAIN IS 5 M.A.

⏚ DENOTES CHASSIS GROUND.

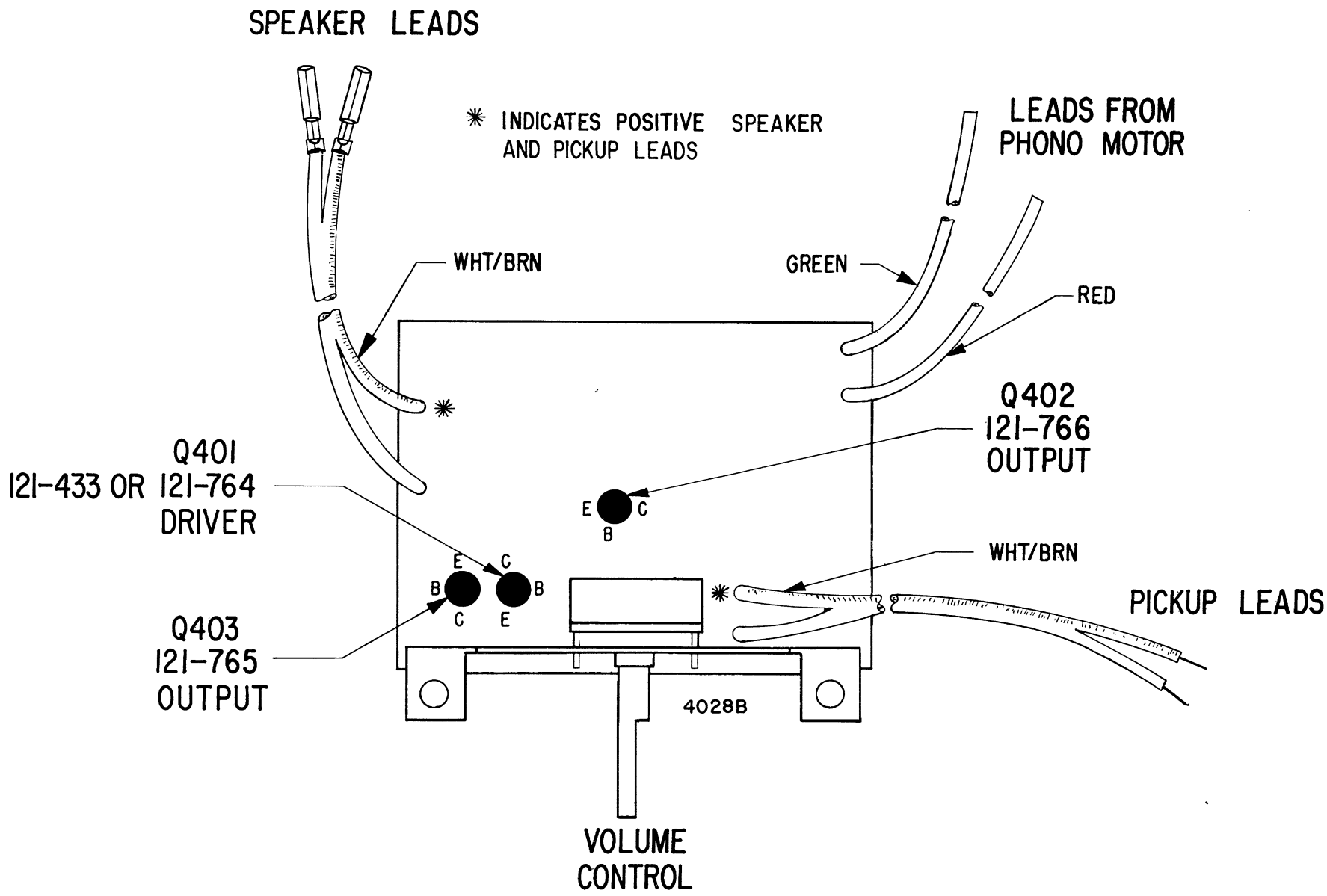
S-82931 FM TUNER ASSEMBLY SCHEMATIC



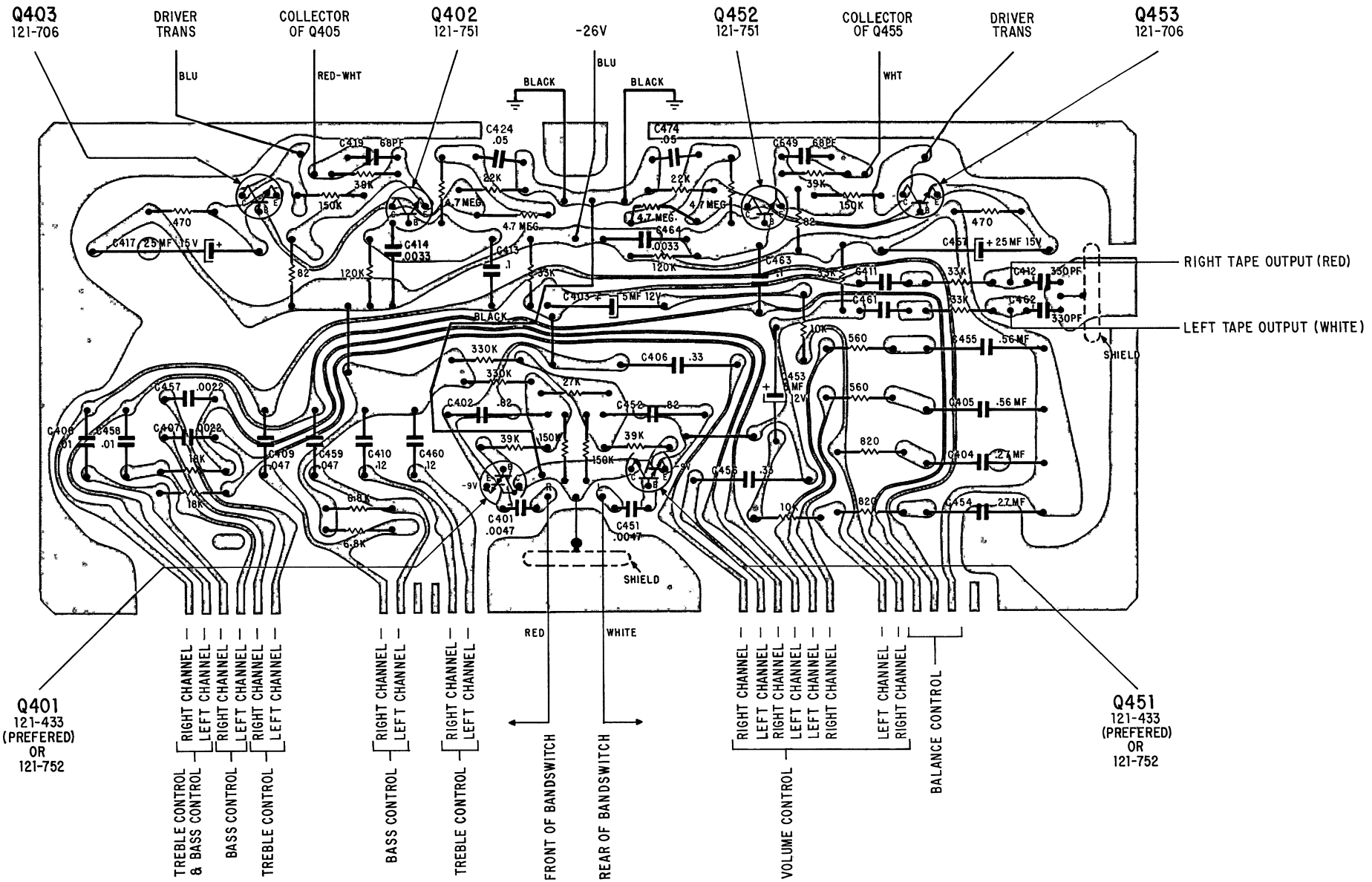
3AT20 CHASSIS WIRING AND COMPONENTS AS VIEWED FROM FOIL SIDE



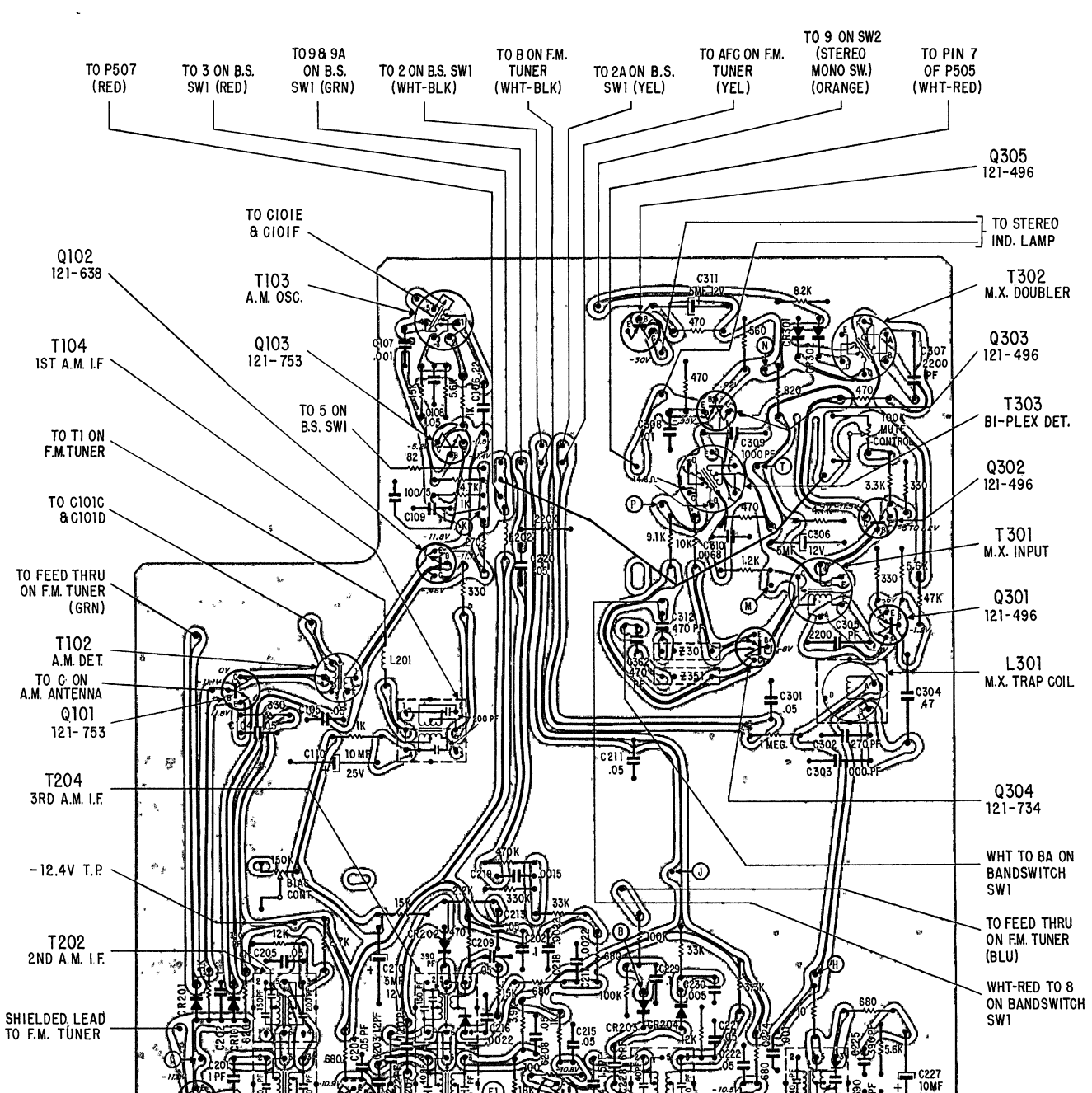
3AT20 SCHEMATIC



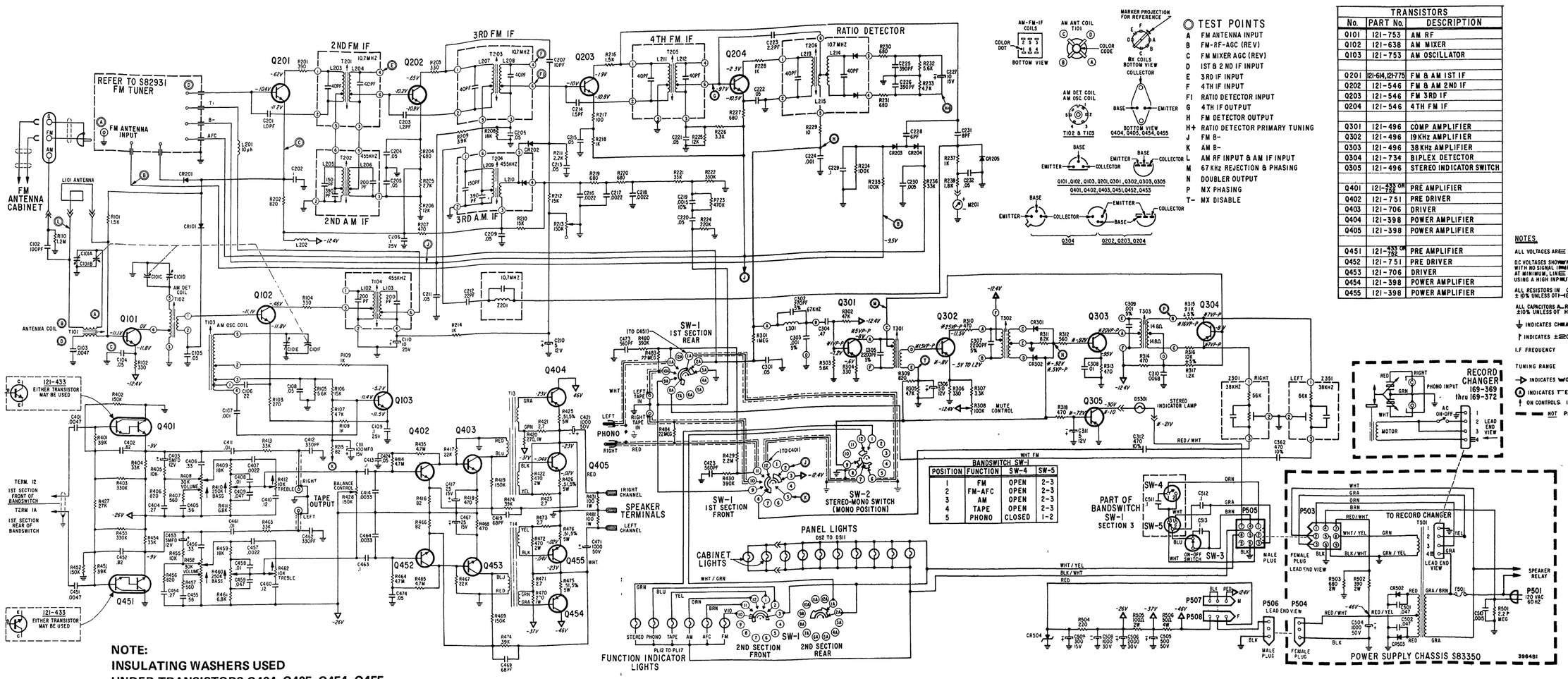
3AT20 CHASSIS LAYOUT



25AT20 AUDIO CHASSIS WIRING AND COMPONENTS AS VIEWED FROM FOIL SIDE



25AT20 - RF-CHASSIS WIRING AND COMPONENTS AS VIEWED FROM FOIL SIDE



NOTE:
INSULATING WASHERS USED
UNDER TRANSISTORS Q404, Q405, Q454, Q455

AM-FM-IF COILS — COLOR DOT — BOTTOM VIEW

AM ANT COIL T101 — COLOR CODE

AM DET COIL AM OSC COIL — T102 & T103

MARKER PROJECTION FOR REFERENCE

MX COILS BOTTOM VIEW — BOTTOM VIEW Q404, Q405, Q454, Q455

Q101, Q102, Q103, Q201, Q301, Q302, Q303, Q305 — Q401, Q402, Q403, Q451, Q452, Q453

Q304 — Q202, Q203, Q204

TEST POINTS

A	FM ANTENNA INPUT
B	FM-RF-AGC (REV)
C	FM MIXER AGC (REV)
D	IST & 2 ND IF INPUT
E	3RD IF INPUT
F	4TH IF INPUT
F1	RATIO DETECTOR INPUT
G	4TH IF OUTPUT
H	FM DETECTOR OUTPUT
H+	RATIO DETECTOR PRIMARY TUNING
J	FM B-
K	AM B-
L	AM RF INPUT & AM IF INPUT
M	67 KHz REJECTION & PHASING
N	DOUBLER OUTPUT
P	MX PHASING
T-	MX DISABLE

TRANSISTORS

No.	PART No.	DESCRIPTION
Q101	121-753	AM RF
Q102	121-638	AM MIXER
Q103	121-753	AM OSCILLATOR
Q201	121-614, 121-775	FM & AM IST IF
Q202	121-546	FM & AM 2ND IF
Q203	121-546	FM 3RD IF
Q204	121-546	4TH FM IF
Q301	121-496	COMP AMPLIFIER
Q302	121-496	19KHz AMPLIFIER
Q303	121-496	38KHz AMPLIFIER
Q304	121-734	BIPLEX DETECTOR
Q305	121-496	STEREO INDICATOR SWITCH
Q401	121-733 OR 121-752	PRE AMPLIFIER
Q402	121-751	PRE DRIVER
Q403	121-706	DRIVER
Q404	121-398	POWER AMPLIFIER
Q405	121-398	POWER AMPLIFIER
Q451	121-733 OR 121-752	PRE AMPLIFIER
Q452	121-751	PRE DRIVER
Q453	121-706	DRIVER
Q454	121-398	POWER AMPLIFIER
Q455	121-398	POWER AMPLIFIER

BANDSWITCH SW-1

POSITION	FUNCTION	SW-4	SW-5
1	FM	OPEN	2-3
2	FM-AFC	OPEN	2-3
3	AM	OPEN	2-3
4	TAPE	OPEN	2-3
5	PHONO	CLOSED	1-2

NOTES.

ALL VOLTAGES ARE⎓ D.C. UNLESS OTHERWISE SPECIFIED.

DC VOLTAGES SHOWN ARE MEASURED FROM CHASSIS, WITH NO SIGNAL INPUT, LOUDNESS CONTROL AT MINIMUM, LINE VOLTAGE 120 V.A.C. USING A HIGH INPUT IMPEDANCE V.T.V.M..

ALL RESISTORS IN OHMS, 1/2 WATT CARBON, ±10% UNLESS OTHERWISE SPECIFIED.

ALL CAPACITORS ARE IN MICROFARADS ±10% UNLESS OTHERWISE SPECIFIED.

⏚ INDICATES CHASSIS GROUND.

INDICATES ±⎓20% TOLERANCE.

I.F FREQUENCY AM 455 KHz FM 10.7 MHz

TUNING RANGE AM 540-1600 KHz FM 88-108 MHz

→ INDICATES VOLTAGE SOURCE

Ⓐ INDICATES TEST POINTS.

INDICATES MAXIMUM POSITION.

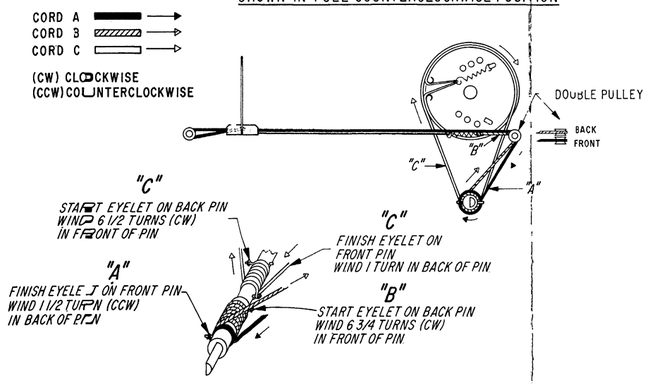
ON CONTROLS

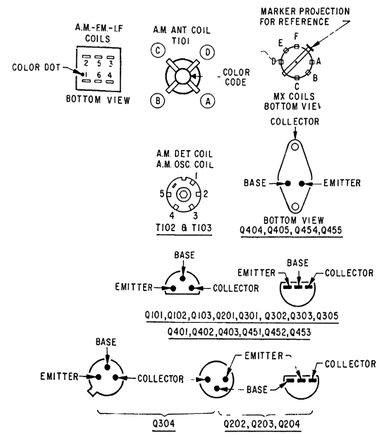
NOT PRINTED CIRCUIT BOARD.

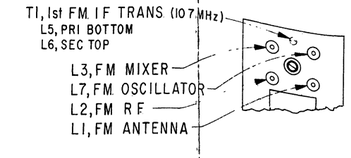
25AT20 SCHEMATIC

DIAL CORD DRIVE

SHOWN IN FULL COUNTERCLOCKWISE POSITION







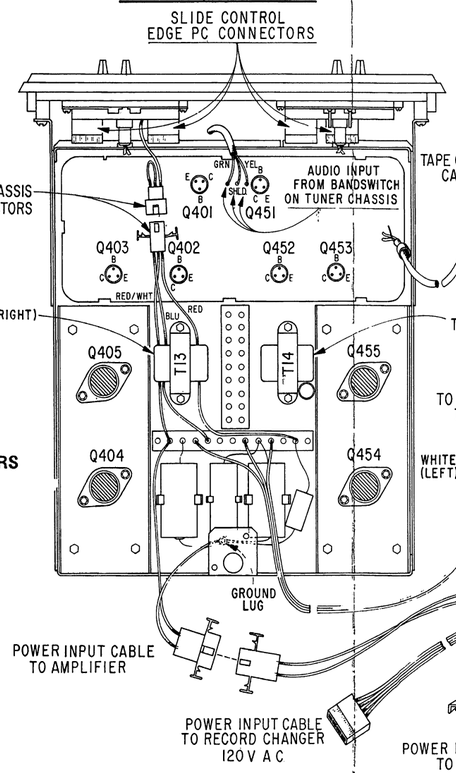
TEST POINTS

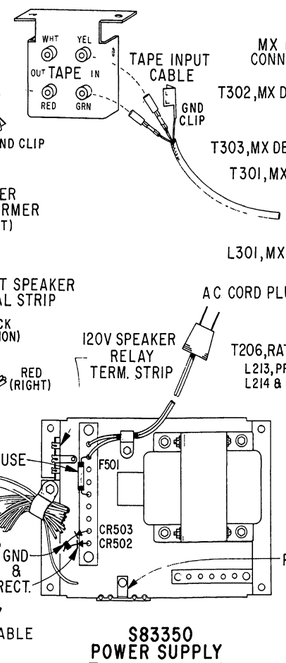
A	FM ANTENNA INPUT
B	FM-R.F-A.G.C (REV)
C	FM MIXER A.G.C (REV)
D	1st & 2nd I.F INPUT
E	3rd I.F INPUT
F	4th I.F INPUT
FI	RATIO DETECTOR INPUT
G	4th I.F OUTPUT
H	FM DETECTOR OUTPUT
H+	RATIO DETECTOR PRIMARY TUNING
J	FM B-
K	A.M. B-
L	A.M. R.F INPUT & A.M. I.F INPUT
M	67 KHz REJECTION & PHASING
N	DOUBLER OUTPUT
P	MX PHASING
T	MX DISABLE

TRANSISTORS

No.	PART No.	DESCRIPTION
Q1	121-731	FM. R.F.
Q2	121-732	FM. MIXER
Q3	121-432	FM. OSCILLATOR
Q101	121-753	A.M. R.F.
Q102	121-638	A.M. MIXER
Q103	121-753	A.M. OSCILLATOR
Q201	121-614	FM. & A.M. 1st I.F.
Q202		FM. & A.M. 2nd I.F.
Q203	121-546	FM. 3rd I.F.
Q204		4th FM. I.F.
Q301		COMP. AMPLIFIER
Q302	121-496	19KHz AMPLIFIER
Q303		38KHz AMPLIFIER
Q304	121-734	BIPLEX DETECTOR
Q305	121-496	STEREO INDICATOR SWITCH
Q401	121-752	PRE AMPLIFIER
Q402	121-751	PRE DRIVER
Q403	121-706	DRIVER
Q404 Q405	121-398	POWER AMPLIFIER
Q451	121-752	PRE AMPLIFIER
Q452	121-751	PRE-DRIVER
Q453	121-706	DRIVER
Q454 Q455	121-398	POWER AMPLIFIER

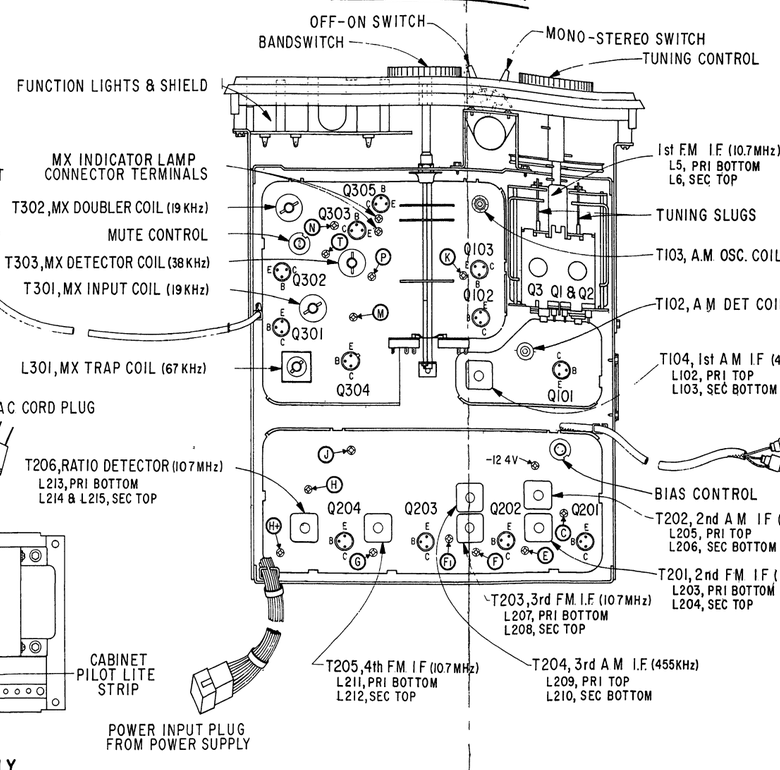
AMPLIFIER, TOP VIEW

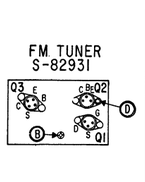


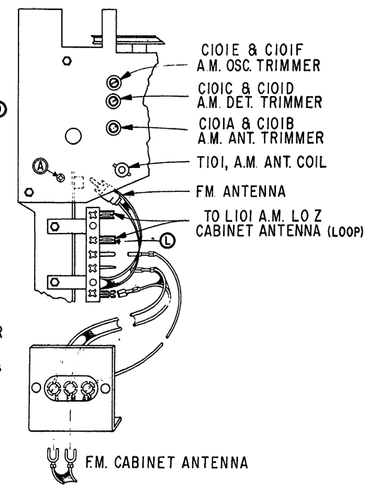


S83350 POWER SUPPLY

TUNER, BOTTOM VIEW



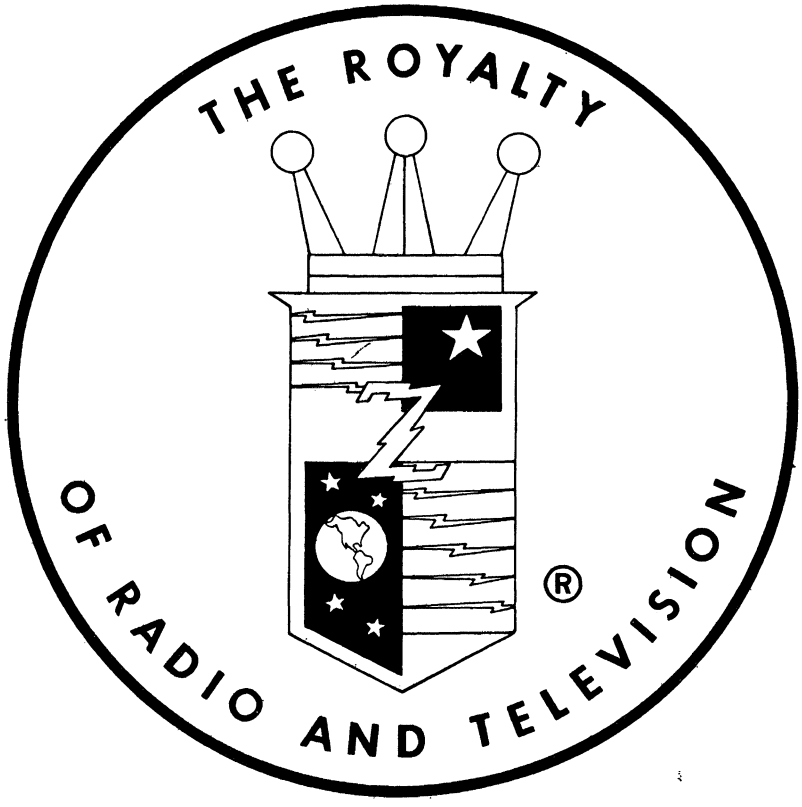




ANTENNA TERMINAL

NOTE:
INSULATING WASHERS USED UNDER TRANSISTORS Q404, Q405, Q45-4, Q455

25AT20 - CHASSIS LAYOUT



ZENITH RADIO CORPORATION

1900 N. AUSTIN AVENUE CHICAGO, ILLINOIS 60639

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

923-576 HF18S RR 8/69 30M

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