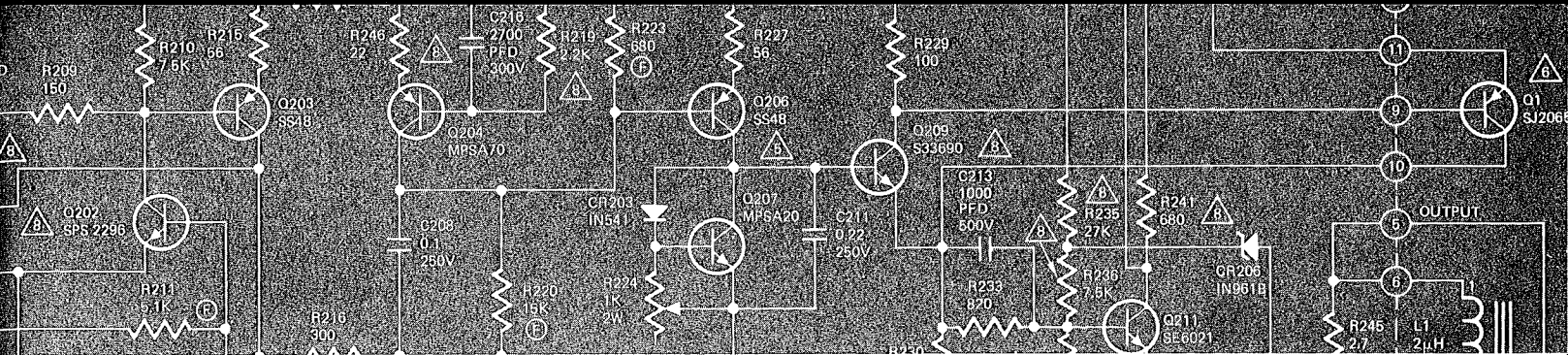
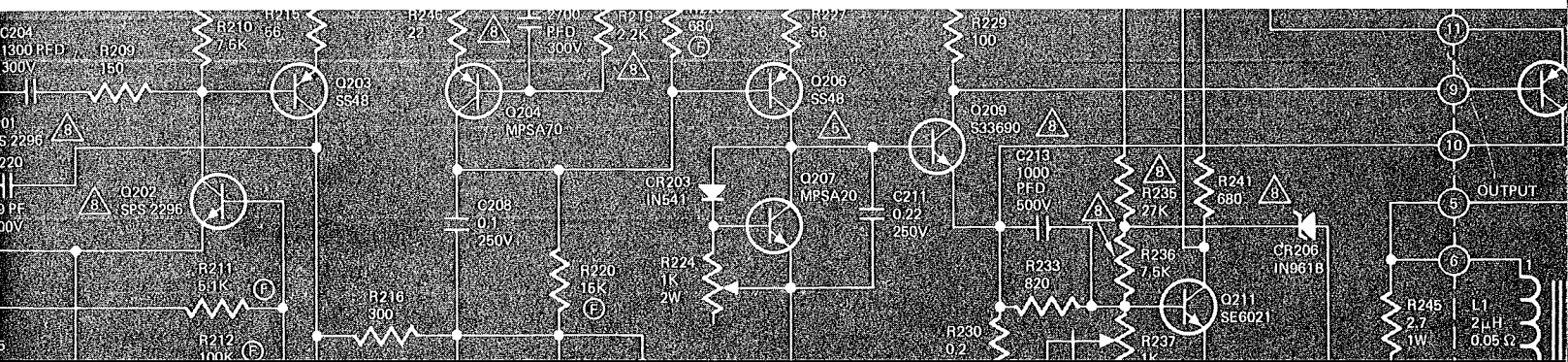


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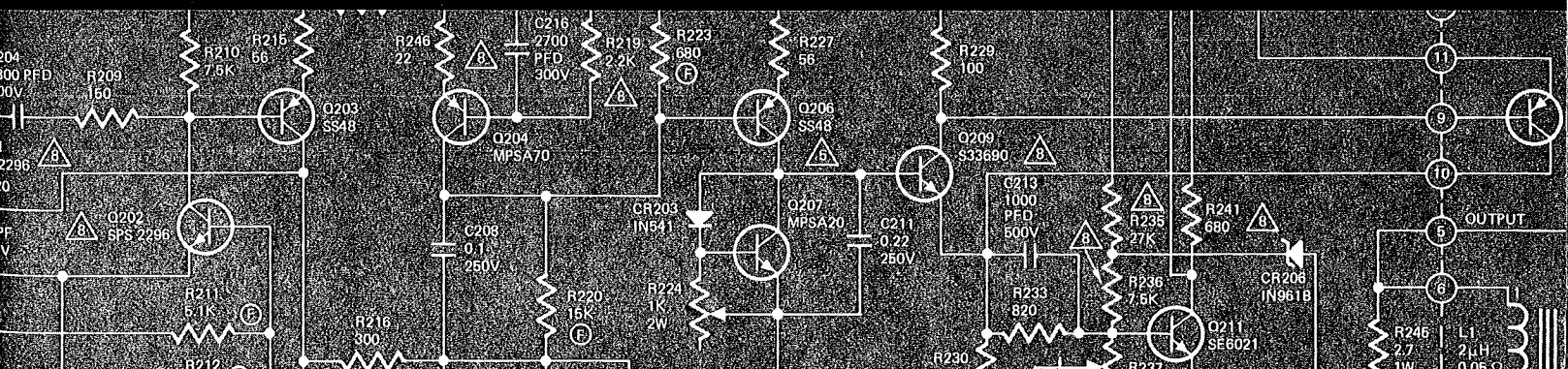


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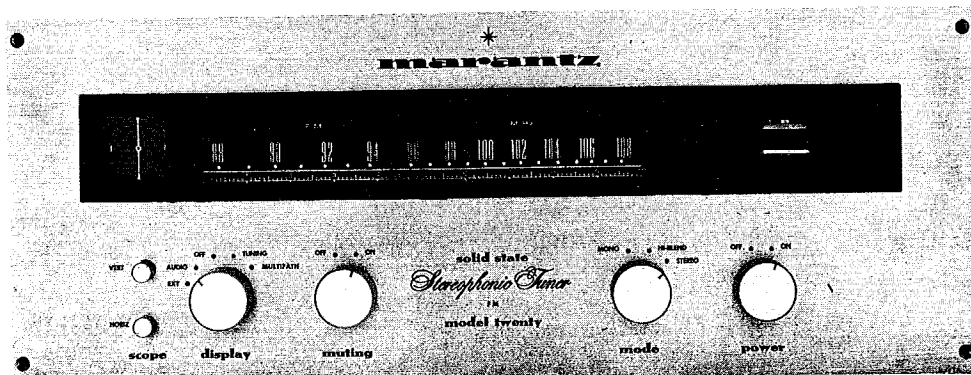


*Stereophonic Tuner*



**marantz®**

**MODEL TWENTY**



**STEREOPHONIC TUNER**

**SERVICE MANUAL**

NO. 199-1066

MARANTZ CO., INC. • P.O. Box 99 • SUN VALLEY, CALIFORNIA • 91352  
A WHOLLY-OWNED SUBSIDIARY OF SUPERSCOPE INC., SUN VALLEY, CALIFORNIA 91352

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## INTRODUCTION

This service manual was prepared for and is intended for use only by factory authorized warranty repair stations and other equally qualified and equipped individuals or corporations.

The adjustment, maintenance, and troubleshooting information listed herein is for the Marantz Model 20 and 20B F.M. Stereophonic Tuner. Service of any type on this unit should be attempted ONLY by EXPERIENCED PERSONNEL, ones knowledgeable in solid state F.M. tuner operation and the PROPER use of the associated test equipment listed herein. ALL instructions should be read CAREFULLY and FULLY understood BEFORE proceeding with ANY service. To better understand the functions of the Model 20 Tuner you may wish to consult the Model 20 OWNER'S MANUAL which provides a brief functional and technical description including a block diagram.

Check the serial number on the lower left area of the back to determine whether the model is a 20 or a 20B.

### CAUTION

- HAZARDOUS VOLTAGES EXIST on the POWER SUPPLY AND SCOPE BOARDS (up to 700 volts d.c.). CARE should be taken when working in these areas. The MPX. OSC. and MATRIX BOARDS have 200 volts d.c. on them, CAUTION should be used here also.
- DO NOT discharge ANY CAPACITORS in the Model 20 with a dead short, i.e., a screw driver blade. To do so may cause multiple failures of the field effect transistors contained in it. ALSO if during troubleshooting you wish to place outside capacity in parallel with ANY capacitors in the Model 20, turn the power OFF FIRST. Discharge BOTH the INTERNAL and EXTERNAL capacitors with a 10 ohm 1 watt resistor, then connect them in parallel and restore power to the unit.

## SERVICE NOTES

The service notes that follow, and the "symptoms" (and their remedies) listed in the alignment and troubleshooting sections of this manual identify some of the service problems that have been or may be encountered in the field. As the Marantz Company becomes aware of other field problems, supplementary service bulletins will be issued to all warranty stations. To improve this service, all problems (and/or their solutions) not covered in this service manual should be brought to the attention of the National Service Manager at our Sun Valley, California location. (See rear cover of Manual for address.)

### NOTE

If a defect is found in an assembly and the assembly does not contain the latest modifications and/or changes listed herein (or in future service bulletins), they should be performed at once.

#### 1. PROLONGING CRT LIFE

Maintaining the display on the screen of the CRT for prolonged or excessive periods or with excessive brightness will eventually cause the phosphor coating on the face of the CRT to develop "burned areas"; to extend the life of the CRT, it is recommended that the "DISPLAY" switch be placed in the "OFF" position when the scope is not actually in use.

### NOTE

If excessive brightness occurs when trace is on screen, see SCOPE BOARD section of this manual for adjustment.

#### 2. CRT SOCKET SHORTS

Any Model 20 returned for service should be checked to be certain that pin No. 10 has been removed from the CRT socket. If it has not been removed, disassemble the socket and remove it. If not removed, it may cause a short and damage the circuitry of the scope board.

#### 3. SHORTS IN CRT

If a problem exists in the "scope" circuit, and a short seems to exist on the "scope board," disconnect the CRT and check it for internal shorts. This may be the problem and not the board. If the CRT is shorted, DO NOT attempt repairs. Replace it with a new one.

#### 4. EXCESSIVE 38 KHz ON THE OUTPUT AND STEREO LAMP FLICKER

The above problems can be corrected by modifying the multiplex oscillator and matrix boards as follows:

- Remove and discard R524 (27K,  $\pm 10\%$ , 1/4W) on the multiplex oscillator board.
- Remove and discard C511 (0.01  $\mu$ F, disc.) on the multiplex oscillator board.
- Install a diode P/N 335-1004 in the same holes used for C511. The cathode (band) end to the collector of Q505, anode end to existing jumper wire.
- Remove the end of the jumper wire that went to R524, and reroute to run between the above diode and Z501, then around Z501 between it and R506. Finally, bend it to the left, cut, strip, and connect to Pin No. 504 and solder.
- Remove R514 (82 ohms,  $\pm 5\%$ , 1/4W) on the multiplex oscillator board and R631 (68 ohms,  $\pm 5\%$ , 1/4W) on the multiplex matrix board and exchange their positions. R514 is now 68 ohms and R631 is now 82 ohms.
- Remove R530 (220 ohms,  $\pm 10\%$ , 1/4W) on the multiplex oscillator board and R621 (22K,  $\pm 5\%$ , 1/4W) on the multiplex matrix board and exchange their positions. R530 is now 22K and R621 is now 220 ohms.
- Install a 0.03  $\mu$ F, 100V capacitor P/N 383-1002 between terminals No. 606 and No. 616 on the multiplex matrix board.
- Perform entire multiplex alignment and set is then ready for use.

#### 5. MUTING CHATTER

The problem of muting chatter can be corrected by adding the following parts to the "copper side" of the multiplex oscillator board.

- Install a 0.01  $\mu$ F cap (C519) P/N 314-1003 across R501 (18K,  $\pm 2\%$ , 1/4W).
- Install a 0.01  $\mu$ F cap (C520) P/N 314-1003 across R507 (12K,  $\pm 2\%$ , 1/4W).
- Install a 0.1  $\mu$ F cap (C521) P/N 383-1007 between the collector and base of Q503.
- Re-adjust the muting level (see limiter adjustments) and the set is then ready for use.

#### 6. IMPROPER MUTING OPERATION UNDER LOW LINE VOLTAGE CONDITIONS (95V TO 105V).

This problem can be corrected by the following:

- Remove and discard R520 (120K,  $\pm 5\%$ , 1/4W).
- Change Q505 from P/N 334-1017 to P/N 334-1034.
- Check and/or adjust muting level (see limiter adjustments) and the set is then ready for use.

#### 7. SHORT STEREO INDICATOR LAMP LIFE

The life of the stereo indicator lamp can be increased by changing R2 (150 ohms,  $\pm 10\%$ , 1/4W) P/N 326-1184 to 330 ohms,  $\pm 5\%$ , 1W, P/N 326-1186. R2 is located near the tuning knob, inside of the dial pan (front panel must be removed).

# TEST EQUIPMENT REQUIRED FOR SERVICING

Table 1 lists the test equipment required for servicing the Model 20 FM Stereo Receiver. The wattmeter, AC voltmeter, and variac may be assembled as a test fixture as shown schematically in Figure 1.

Item	Manufacturer and Model No. (or equivalent)	Use
Distortion Analyzer	Hewlett Packard, Model 331A or 333A	Measures distortion and voltage of tuner output.
Audio Oscillator	Weston Model CVO-100P (NOTE: Less than 0.02 percent residual distortion is required.)	Sinewave signal source.
Oscilloscope	Tektronix, Model 503; or 422	Waveform analysis and troubleshooting.
VTVM	RCA Senior Volt-Ohmyst, Model WV-98C	Voltage and resistance measurements.
AC Wattmeter	Simpson, Model 390	Monitors primary power consumption of tuner.
Line Voltmeter (0 to 150 VAC)	Commercial grade	Monitors potential of primary power to tuner.
Variable Autotransformer (0 to 140 VAC, 10 amps)	Powerstat, Model 116B	Adjusts level of primary power to tuner.
Power Supply Bleeder Resistor (10 ohms at 1W)	Commercial grade	Discharges power supply filter capacitors prior to disassembly or resistance measurements.
AC Power Control Box	Optional item. Fabricate in accordance with Figure 1.	Monitors and controls primary power for tuner.
FM-MPX Generator	Sound Technology, Model 1000A	FM and MPX alignment.
10.7 MHz Crystal OSC	Any unit with frequency accuracy of $\pm 0.01\%$	FM alignment (detector).
88, 98, 108 MHz and 1 MHz Harmonic Crystal OSC	Any unit with frequency accuracy of $\pm 0.01\%$	FM alignment (front end).
Matching Transformer 50 $\Omega$ to 300 $\Omega$ ; 1:1 voltage ratio	Sound Technology, Model 100	Convert 50 $\Omega$ generator output to 300 $\Omega$

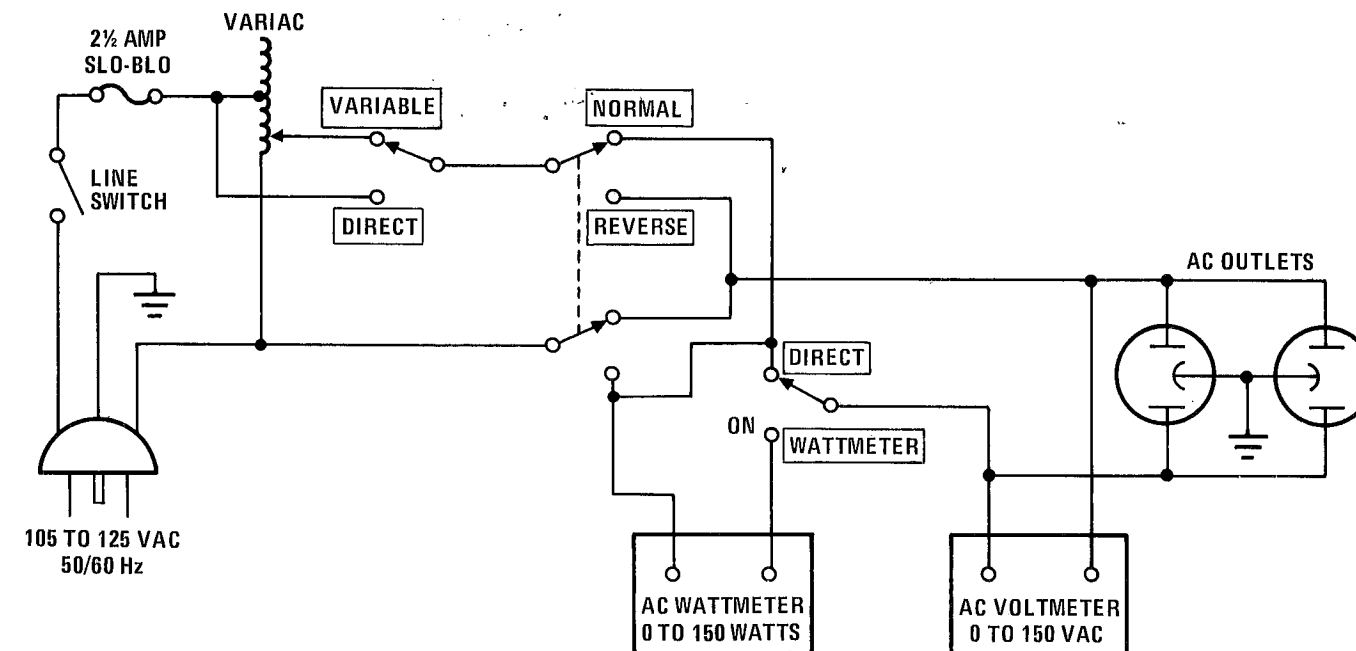


FIGURE 1 – AC POWER CONTROL BOX SIMPLIFIED SCHEMATIC

## 240 VOLT A.C. AND 50 MICROSECOND (EUROPEAN DE-EMPHASIS CONVERSION)

To convert the Model 20 to 240 VAC and 50 $\mu$ sec (European) de-emphasis, perform the following steps.

1. Place unit upside down.
2. Remove the bottom cover.
3. Orient the Model 20 so that the rear of the unit is toward you.
4. Locate TB4, the terminal strip that is on the left of the unit and towards you, just below the power transformer and to the rear of the chassis.
5. Unsolder and remove the two jumpers on TB4 (black-yellow No. 2 to black-red No. 1 and black-green No. 3 to black No. 4). Reverse the black-yellow and black-red wires on terminals No. 1 and No. 2.
6. Using one of the removed jumpers, connect the black-red No. 2 and black-green No. 3 on TB4.

### NOTE

Make sure one side of the line is connected to TB4 terminal No. 1 and the other side and R13 are connected to terminal No. 4.

7. Replace the  $\frac{1}{2}$  amp fuse in the unit with the 0.4 amp, 250 volt fuse, part No. 451-1014 supplied with the 240 volt conversion kit part No. 108-1001-1.

8. Locate MPX MATRIX Board (the board approximately in the center of the unit).

9. Remove the five screws that hold down the board.

### NOTE

Don't loose the small nylon washers under the screw heads.

10. Locate R615 and R616 ( $11.3K \pm 1\%$ ) on MPX MATRIX Board (top left side of board as viewed from the rear of the unit, looking at the component side of the board) next to L601 and L602 toroid coils.

11. Two ways are available for the remaining conversion:

- a. Remove R615 and R616 and replace them with two  $5.3K \pm 1\%$  resistors part No. 430-4530 in the 240 volt conversion kit, or
- b. Connect two  $10K \pm 1\%$  resistors, part No. 330-1019, one each in parallel with R615 and R616.

12. Replace the MPX. MATRIX Board and the bottom cover.

13. Affix caution label, part No. 180-1027. The Model 20 is now ready for 240 volt A.C. -50  $\mu$ sec de-emphasis (European) use.

# TECHNICAL SPECIFICATIONS

(NOMINAL)

## FM SECTION:

	20	20B
IHF Usable Sensitivity . . . . .	2.8 $\mu$ V	1.8 $\mu$ V
Quieting Scope . . . . .	-50 dB at 5 $\mu$ V	-55 dB at 5 $\mu$ V
	-60 dB at 10 $\mu$ V	-62 dB at 10 $\mu$ V
	-70 dB at 50 $\mu$ V	-73 dB at 50 $\mu$ V
Total Harmonic Distortion, 400 Hz, 100% Mod. . . . .	0.15% Maximum	
Frequency Response (ref. 75 sec. de-emphasis) 20 to 15 KHz . . . . .	$\pm$ 0.5 dB	
Multiplex Separation . . . . .	20 Hz 40 dB Minimum	
	1,000 Hz 45 dB Minimum	
	10,000 Hz 35 dB Minimum	
	15,000 Hz 30 dB Minimum	
Sub-Carrier (38 KHz) Suppression . . . . .	60 dB Minimum	
SCA Pilot Carrier (67 KHz) Suppression . . . . .	65 dB Minimum	
IF Bandwidth . . . . .	.3 dB at 230 KHz	
	80 dB at 880 KHz	
Total Spurious Rejection . . . . .	Better than 90 dB	
Image Rejection . . . . .	85 dB	
Output Level . . . . .	1V RMS	

## GENERAL:

Power Requirements . . . . .	105 to 125 VAC 50 to 60 Hz 50 watts
Overall Dimensions (including feet) . . . . .	15-3/8 Wide x 6-1/8 High x 14-1/8 Deep
Front Panel Dimensions . . . . .	15-3/8 Wide x 5-3/4 High
Shipping Weight . . . . .	25 Pounds

# PERFORMANCE VERIFICATION

## A. TEST EQUIPMENT

Refer to TABLE 1 for required test equipment.

## B. POWER CONSUMPTION

1. Make the test setup shown in Figure 2 with the instrument controls set in the following positions:

Line Switch – Off

Variable-Line Switch – Variable

Wattmeter Switch – On

Variac – 0 (fully CCW)

Audio Generator – Frequency – 400 Hz;  
Output – Minimum

Distortion Analyzer – 3 volt range

### NOTE

In the tests that follow, if the distortion analyzer used does not contain a built-in voltmeter, an A.C. VTVM may be substituted.

2. Remove Model 20 top cover.

3. Plug Model 20 into A.C. power control box and turn on Model 20 power switch. Set other Model 20 controls as follows:

Display – OFF

Muting – ON

Mode – STEREO

4. Turn the line switch (on A.C. power control box) on and SLOWLY advance the variac while observing the voltmeter and wattmeter. When the line voltage reaches 120 VAC the wattmeter should indicate approximately 30 watts.

### NOTICE

The wattmeter should NEVER exceed 50 watts while the variac is being increased or when set to 120 volts. If it does, turn variac off and refer to the TROUBLE ANALYSIS section of this manual.

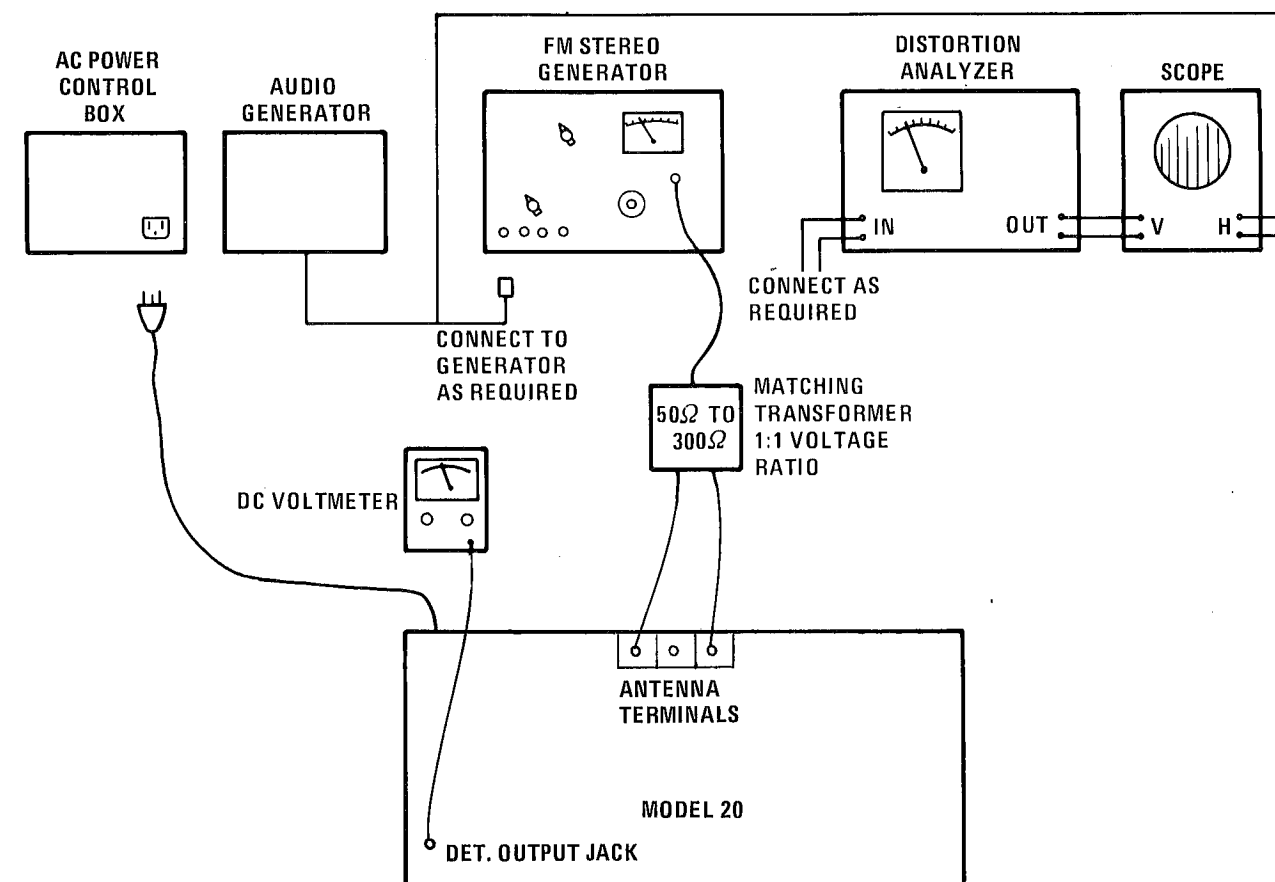


FIGURE 2 – FM TEST SET-UP



## C. PRELIMINARY PROCEDURES

1. Make the test setup shown in Figure 2 with instrument controls set in the following positions:

DC voltmeter — 0.5 volt range; zero set to center scale.

Audio generator — Frequency 400 Hz; output minimum.

Distortion analyzer — 3 volt range.

FM stereo generator — Monaural; ext. modulation; 1K  $\mu$ V output; 98 MHz.

Scope — Adjust as required for a usable trace.

**NOTE**

Make sure power consumption is normal before proceeding (see Section B).

2. Turn on Model 20 and allow to "warm up" for 5 to 10 minutes. Set controls as follows:

Display — Tuning

Muting — Off

Mode — Stereo

Power — On

## D. AUDIO OUTPUT

1. Connect audio generator to LEFT input on FM generator and adjust output level for 100% modulation ( $\pm 75$  KHz deviation).
2. Connect distortion analyzer to either "AUDIO OUTPUT" jack.
3. Tune Model 20 to generator output (98 MHz) and "fine tune" for zero (0) volts on the DC voltmeter.
4. Voltage indicated on the distortion analyzer should be between 0.95 and 1.05 volts.
5. Check other "AUDIO OUTPUT" jack. It should read as above  $\pm 0.5$  dB. If not see line driver "OUTPUT" level adjustment.

## E. HARMONIC DISTORTION

1. With the Model 20 setup and operating as above, set the distortion analyzer to read distortion and null.
2. The distortion should be less than 0.15% on

BOTH "AUDIO OUTPUT" jacks.

3. If not — See "DETECTOR (DISCRIMINATOR) adjustments."

## F. HUM AND NOISE

1. Setup as above and reset distortion analyzer to SET LEVEL. Adjust the sensitivity of the analyzer for zero (0) dB reference level.
2. Switch the FM generator to CW operation and remove the audio oscillator from the left input.
3. Switch the distortion analyzer down scale to the -60 dB range. The hum and noise should read below -5 dB, equivalent to -65 dB (20) or -13 dB on this range, equivalent to -73 dB (20B).

**NOTE**

At this very low level, the FM generators and the Model 20 tend to be slightly "microphonic." Make sure no loud noises such as fans, etc., or poor cable shielding give a false reading.

## G. QUIETING SLOPE

1. Setup as above in section "F" and adjust the FM generator output to 10  $\mu$ V.
2. Set the distortion analyzer as above and note the reading. It should be +2 dB (equivalent to -58 dB) (20) or -2 dB (equivalent to -62 dB) (20B).
3. Set the distortion analyzer up one range to -50 dB.
4. Decrease FM generator output to 5  $\mu$ V.
5. The reading should be +2 dB (equivalent to -48 dB) (20) or -5 dB (equivalent to -55 dB) (20B).

## H. SENSITIVITY

1. Reconnect the audio generator to the LEFT input on the FM generator.
2. Set the FM generator to MONAURAL.
3. Set the distortion analyzer to SET LEVEL and adjust for 0 dB instead of full scale.
4. Switch the distortion analyzer to DISTORTION and switch down three (3) ranges to the -30 dB (3% FS) and null.

5. Reduce the generator output until a reading of 0 dB (-30 dB) is obtained.
6. The FM generator output should be 3.2  $\mu$ V (20); 1.8  $\mu$ V (20B) or less.

**NOTE**

If necessary the tuning of the Model 20 can be retouched slightly to meet the sensitivity spec. provided the indication on the D.C. voltmeter does not go beyond  $\pm 0.2$  volts.

## I. SEPARATION

1. Set the FM generator to STEREO and adjust the 19 KHz pilot level to 10% modulation.
2. Connect the audio generator to the LEFT input on the FM generator.
3. Set the audio generator to 1 KHz and adjust the output level for 90% (plus 10% pilot equals 100%) modulation.
4. Connect the distortion analyzer to the channel "A" "AUDIO OUTPUT" jack and adjust SET LEVEL for 0 dB.
5. Switch the distortion analyzer to channel "B" "AUDIO OUTPUT" jack and note the reading. It should be 45 dB BELOW the 0 dB level obtained in step 4.

**NOTE**

If necessary, the tuning of the Model 20 can be retouched slightly to meet the separation specs provided the indication on the D.C. voltmeter does not go beyond  $\pm 0.2$  volts.

6. Switch the audio generator to the RIGHT input on the FM generator and switch the distortion analyzer to the channel "A" "AUDIO OUTPUT" jack. The reading should be -45 dB.
7. Repeat steps 2 thru 6 changing the audio generator frequency to 15 KHz. The separation should be 30 dB.
8. Repeat steps 2 thru 6 changing the audio generator frequency to 20 Hz. The separation should be 40 dB.
9. If the above specs cannot be met, see the "MULTIPLEX alignment."

## J. FREQUENCY RESPONSE

1. Connect the audio generator to the LEFT input on the FM generator and set the frequency to 200 Hz.

2. Set the FM generator to MONAURAL.
3. Adjust the output of the audio generator for 100% modulation.
4. Set the distortion analyzer to SET LEVEL and adjust the sensitivity for a zero (0) dB reading.
5. Consult the chart on the "MULTIPLEX MATRIX BOARD alignment" page for various frequencies and output levels that should be obtained.
6. It should follow the 75  $\mu$ sec curve within  $\pm 0.5$  dB and the 50  $\mu$ sec (if so connected) curve within  $\pm 1.0$  dB.

## K. DIAL CALIBRATION

1. Unsolder and disconnect the antenna input plug from J200 (20) or J201 (20B) on the front end.
2. Connect the 88, 98, 108 and 1 MHz harmonic crystal oscillator to J200 (20) or J201 (20B) on the front end.
3. Turn on the 98 MHz oscillator (others all OFF).
4. Tune the Model 20 to the 98 MHz "DOT" on the dial scale (cover it with the pointer).
5. The D.C. voltmeter should read zero (0) volts  $\pm 0.4$  volts (an approximate error of  $\pm 20$  KHz).
6. Switch the crystal oscillator to 88 MHz and retune the Model 20 to the 88 MHz "DOT." The reading should be zero (0) volts  $\pm 0.4$  volts.
7. Switch the crystal oscillator to 108 MHz and retune the Model 20 to the 108 MHz "DOT." The reading should be zero (0) volts  $\pm 0.4$  volts.
8. Switch the crystal oscillator to the 1 MHz harmonics and check each of the 1 MHz interval "DOTS" on the dial scale. The readings on the D.C. voltmeter should be zero (0) volts  $\pm 0.4$  volts.
9. If the dial calibration does not fall within the above limits, see the "FRONT END ALIGNMENT" section of this manual.

**NOTE**

The above readings will only be as accurate as possible when the errors in frequency of the crystal oscillator are known and added (or subtracted) to the above.

# TROUBLE ANALYSIS

The following section is designed to assist in locating troubles. The information given is to help in situations where problems may be difficult to isolate. Any field problems that arise will be covered through service bulletins (supplementary to this manual) that will be issued to all service stations. It is assumed that normal troubleshooting techniques (*i.e.*, point-to-point signal tracing, oscilloscope analysis, etc.) will be used to isolate problems.

**CAUTION:** After replacement of any components, increase the variac voltage slowly while monitoring the wattmeter as described in Section A, step 1 of Performance Verification.

**NOTE:** Readjustment of the assembly containing the defective components and a performance verification is necessary following any repair.

SYMPTOM	PROBLEM
1. Excessive line consumption (50 watts or more)	a. Shorted or leaky: CR101 thru CR110; C101 thru C106; V901; C418 and C419; C704 and C713; C522; C9, C10, C11, C14, C15.
2. No or low line consumption	a. Check line cord; fuse; power transformer. b. Open: CR101 thru CR110; DS-2 thru DS-5; V901
3. Low audio output — FM	a. Open: C709; CR701, CR702; C714, C628, C620, C621, C622, C629; Z601, Z602; Q503, Q601 thru Q604, Q501, Q508; CR601 thru CR604; Q801 thru Q804 b. Shorted: Q701; C714; Q601 thru Q604, Q508, Q501, Q504; Z501; Q505; C606, C607, C612, C613, C618, C619, C625, C626; Q801 thru Q804. c. Defective (incorrectly wound or broken) L703.
4. Excessive distortion — FM	a. Low beta: Q701; Q501; Q801 thru Q804. b. Improper matching of Q601 and Q602. c. Defective (incorrectly wound or broken) L703. d. Incorrect "FRONT END" or "I.F." alignment — RETURN TO FACTORY. e. C707 incorrect value.
5. Excessive hum and noise — FM	a. Open or low in capacity: C3, C102 thru C104, C522. b. Noisy: Q201, Q301 thru Q304, Q901, Q904, Q601 thru Q604, Q501, Q508; Q801 thru Q804. c. Open: L502, L504, L601 thru L604; C501, C509, C610, C611, C606, C607, C613, C612, C618, C619, C624, C623, C625, C626; C1, C9, C10, C11, C14, C15, C16. d. Broken shield ground wire. e. Excessive microphonics in FRONT END — RETURN TO FACTORY for replacement. f. Dirty antenna attenuator switch.

**NOTE:** The distortion can be measured at the "DETECTOR OUTPUT" jack, if it is less than 0.2%, the problem lies in the multiplex section.

6. Poor quieting slope and sensitivity	a. Open: Q201; C305, C318, C330, C342, C401, C411, C422, C431; CR403, CR404, CR407, CR408, CR411, CR412, CR413, CR414. b. Low gain: Q201, Q301 thru Q304, Q401 thru Q404. c. Improper FRONT END or I.F. alignment — RETURN TO FACTORY. d. Dirty antenna attenuator switch. e. Defective T1601 - balun input transformer. f. Shorted R.F. cables.
7. Poor multiplex separation	a. Open: L503; T501; CR601 thru CR604; C509, C601 thru C605, C608, C609, C615 thru C617. b. Shorted: L503; T501; CR601 thru CR604; C509, C601 thru C605, C608, C609, C615 thru C617. c. Mismatch of Q601 and Q602. d. I.F. out of alignment — RETURN TO FACTORY.
8. Frequency response — FM (Response on high side of curve.)	a. Low in capacity or open: C612, C613, C618, C619, C625, C626, C614. b. L601 thru L604 — wrong value or open. c. R615 and R616 low in value. d. High in capacity or shorted: C610, C611, C613, C614.
9. Frequency response — FM (Response on low side of curve.)	a. High in capacity or shorted: C612, C613, C615, C618, C619, C625, C626. b. L601 thru L604 wrong value or shorted. c. R615 and R616 high in value. d. Low in capacity or open: C603, C617, C610, C611, C623, C624, C621, C622, C628, C629.
10. Improper muting action when tuning off of station ONLY	a. Open or shorted: Q502; CR501, CR502.
11. Scope trace won't center	a. Incorrect $1_{dss}$ of Q901 and/or Q904. b. Shorted: Q901 thru Q906; C901, C902, C6, C7. c. Open: Q901 thru Q906; R8, R9.
12. Stereo indicator doesn't light	a. Open: DS-1; Q1, R2; Q509, Q605. b. Shorted: Q606, C627, C630, C511, C516.



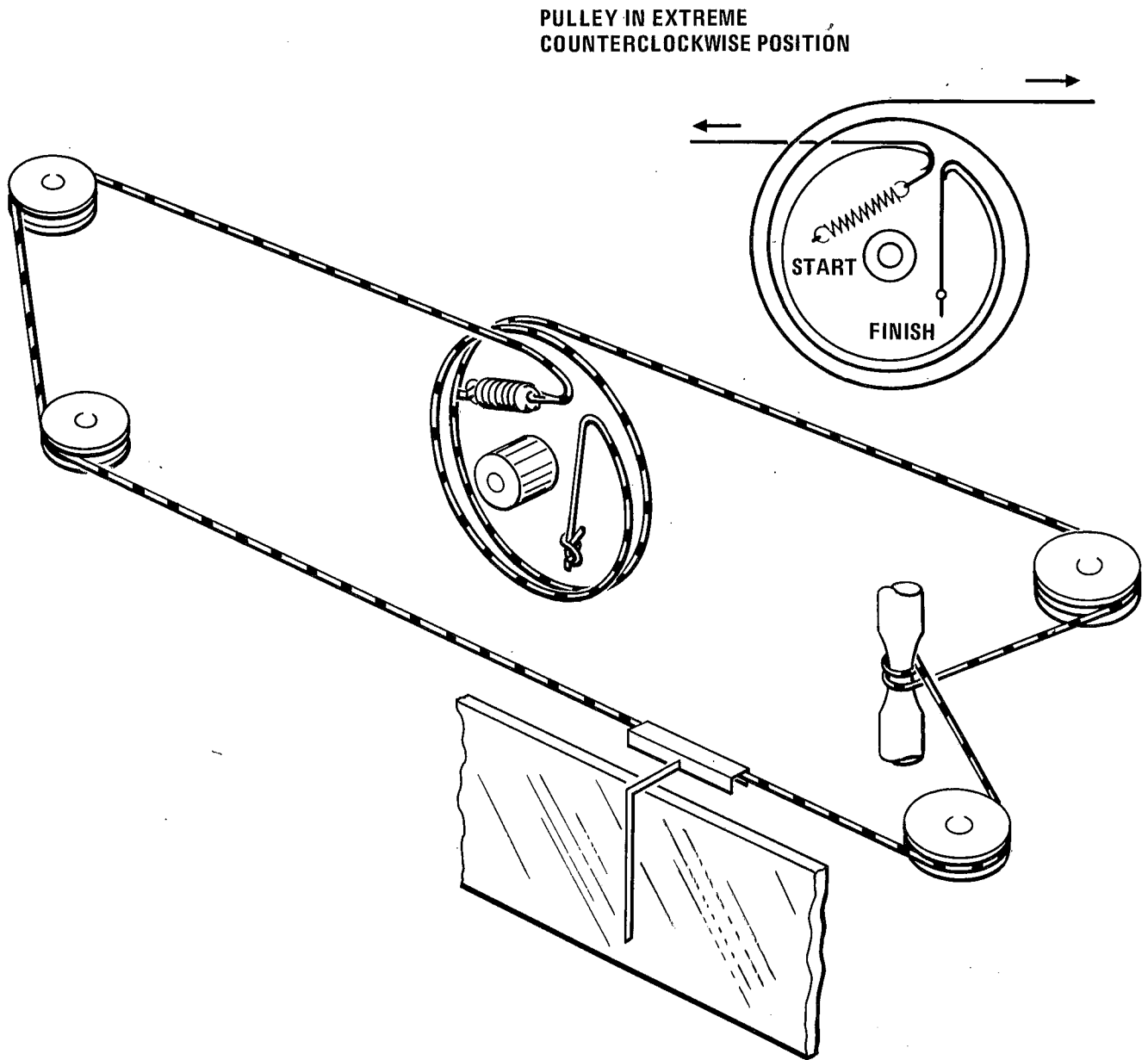


FIGURE 3 – DIAL CORD STRINGING DIAGRAM

NOTE: USE ONLY DIAL CORD REFERRED TO IN PARTS LIST (SEE PAGE 72); DO NOT SUBSTITUTE. OTHERWISE IMPROPER OPERATION WILL RESULT.

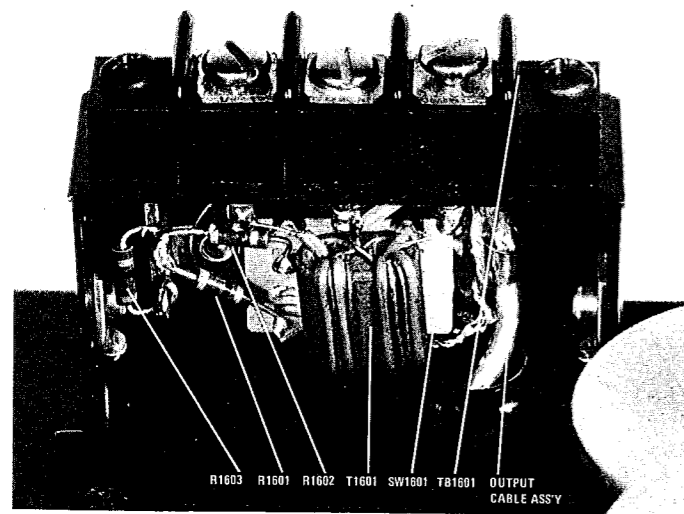


FIGURE 4A - BALUN FRONT VIEW

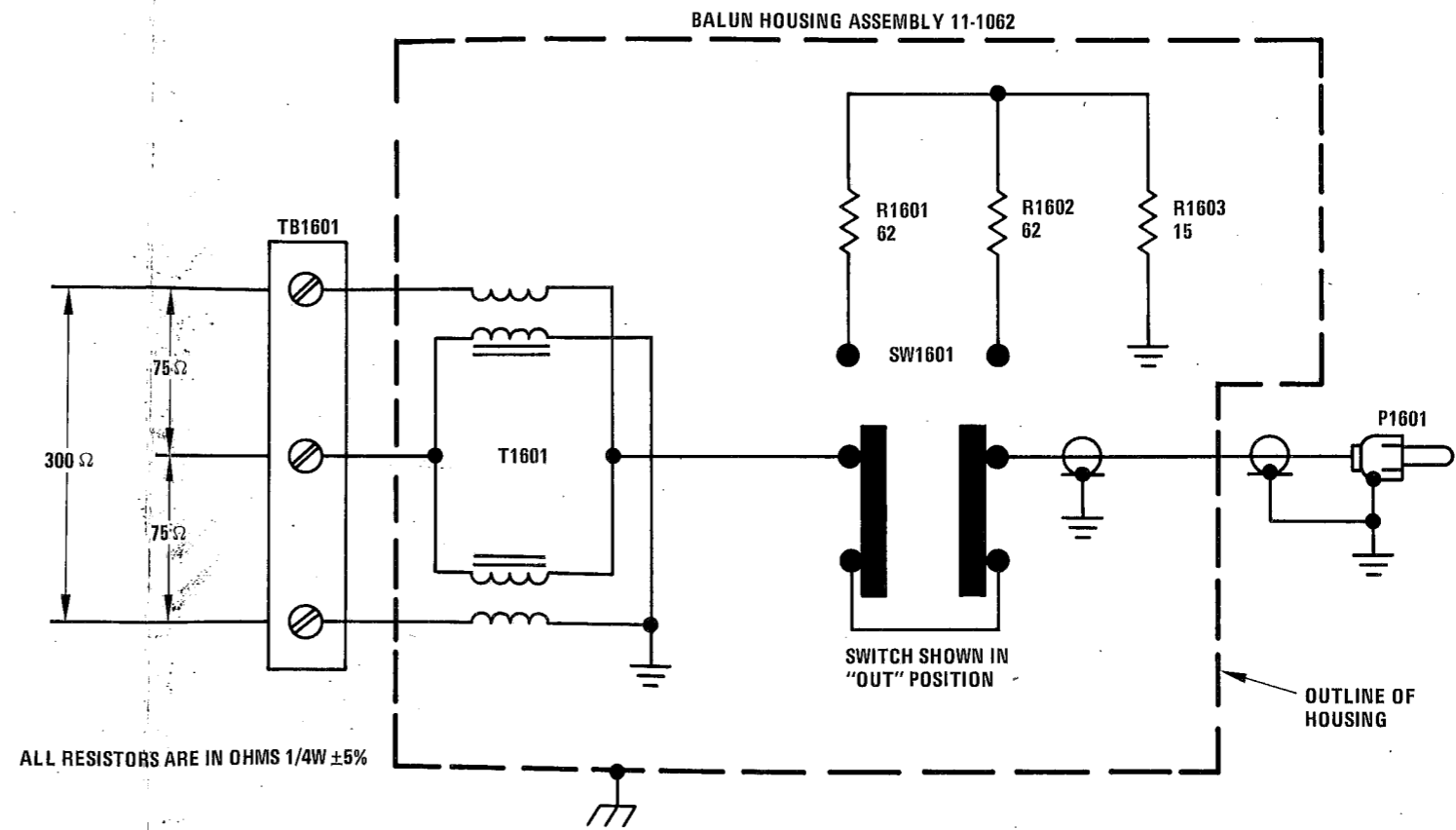
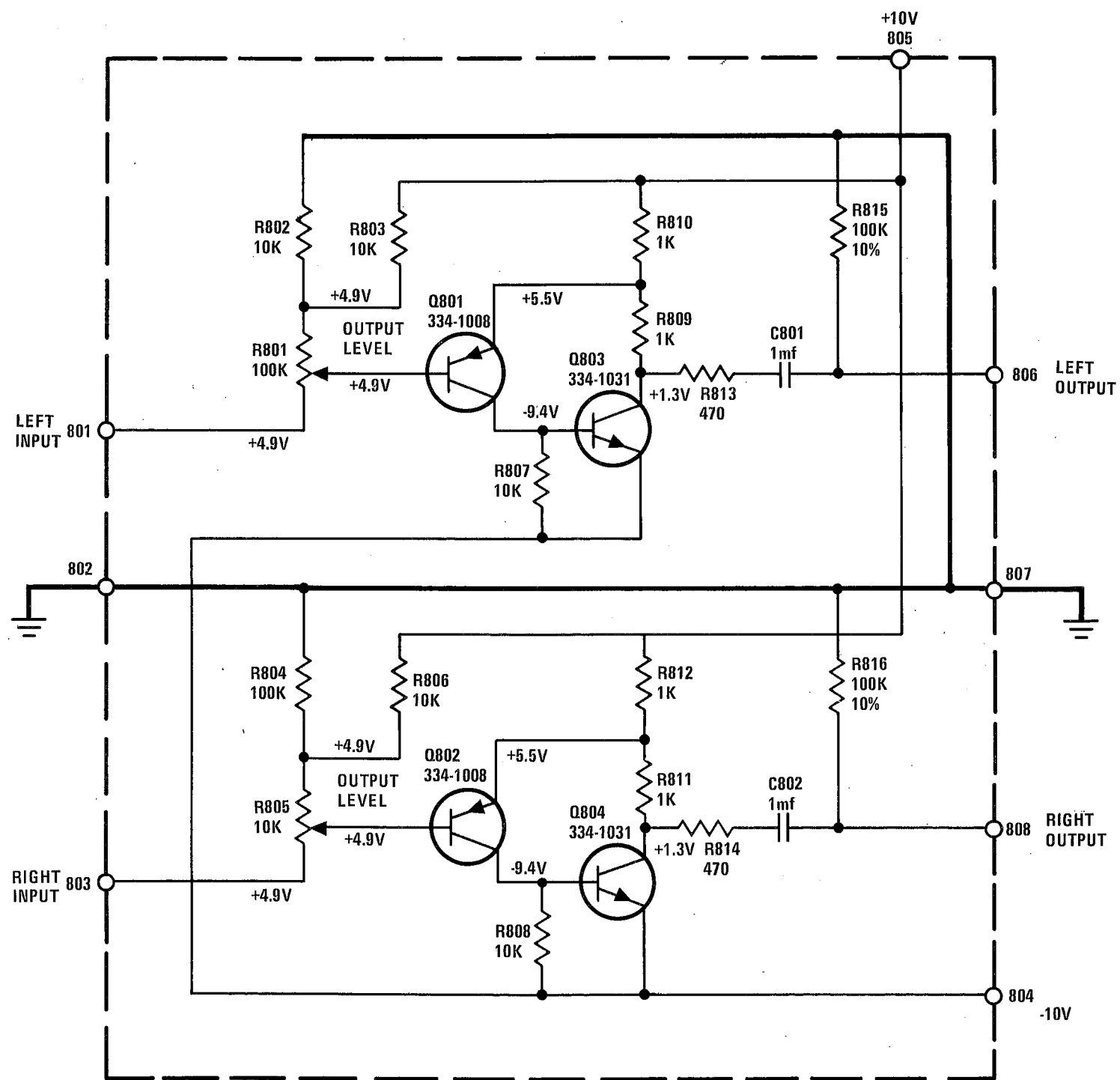


FIGURE 4B - BALUN SCHEMATIC DIAGRAM



UNLESS OTHERWISE NOTED  
ALL RESISTORS ARE IN OHMS 1/4W±5%

FIGURE 6A - LINE DRIVER SCHEMATIC DIAGRAM

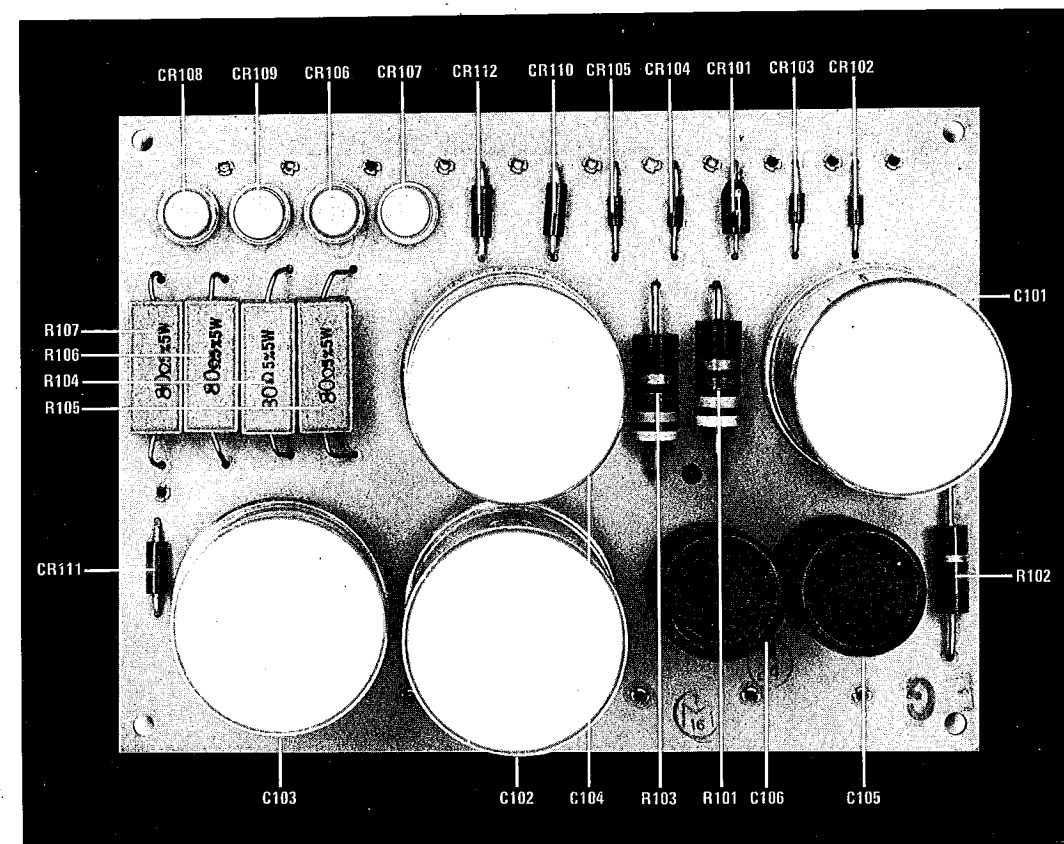


FIGURE 5A - POWER SUPPLY COMPONENT DIAGRAM

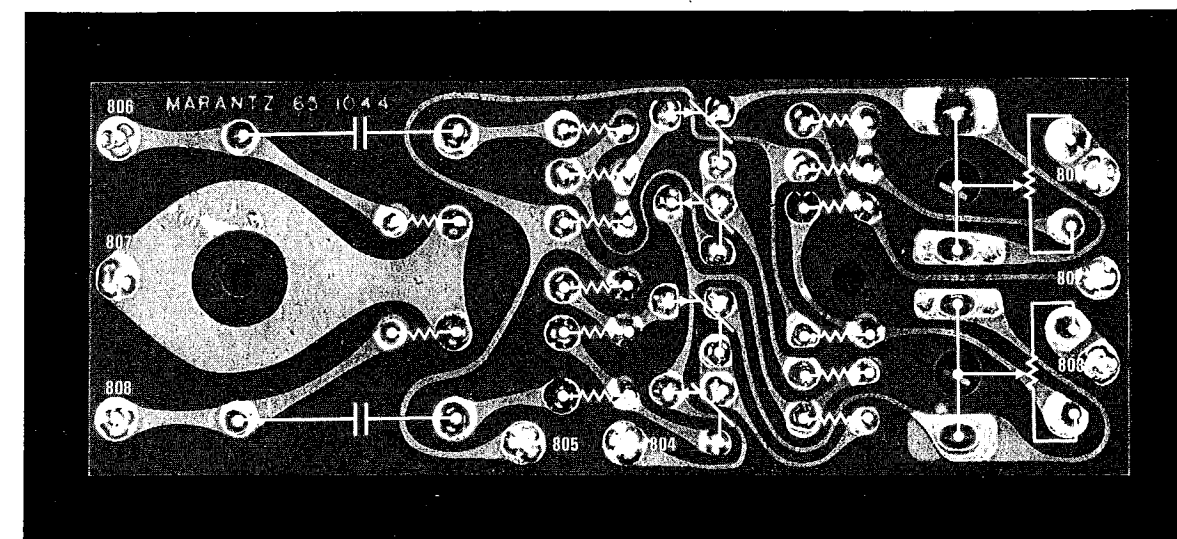


FIGURE 6B - LINE DRIVER CONDUCTOR DIAGRAM

LINE DRIVER ADJUSTMENT

NOTE

Before doing line driver adjustments, completion of all other adjustments except the scope board is mandatory.

1. Connect FM generator to "ANTENNA" terminals.
2. Connect the distortion analyzer to the channel A (left) "AUDIO OUTPUT" jack.

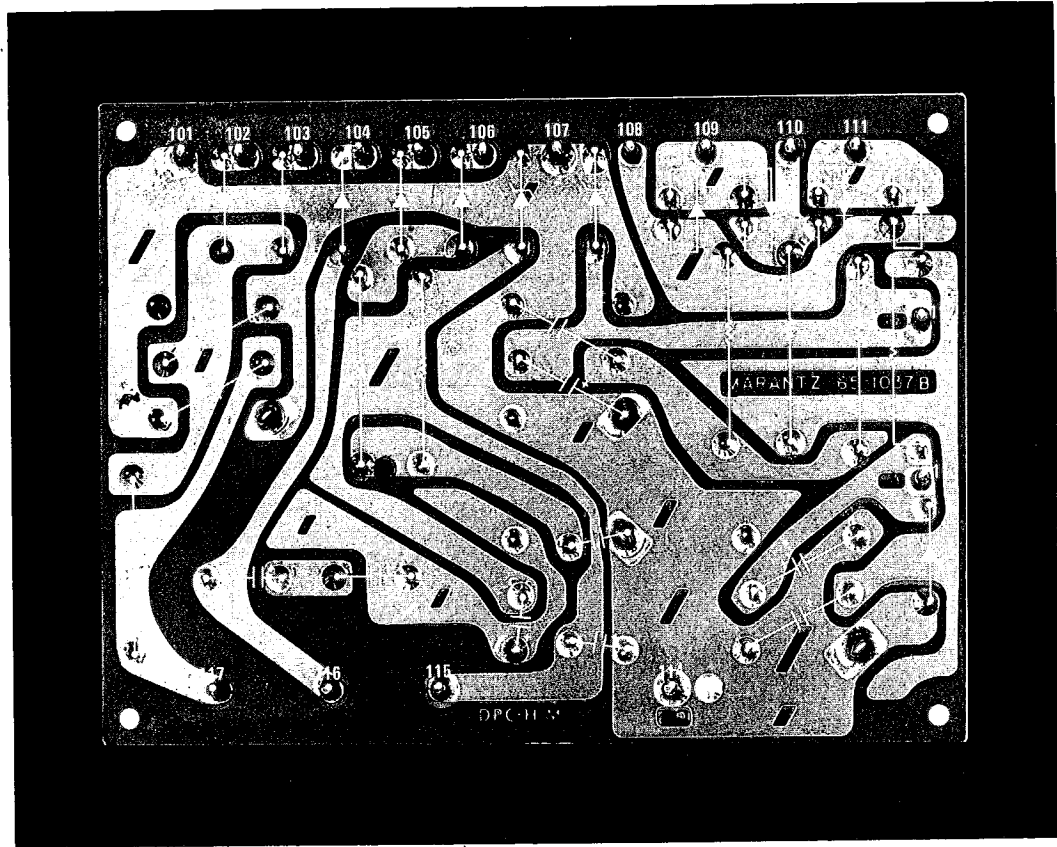


FIGURE 5B - POWER SUPPLY CONDUCTOR DIAGRAM

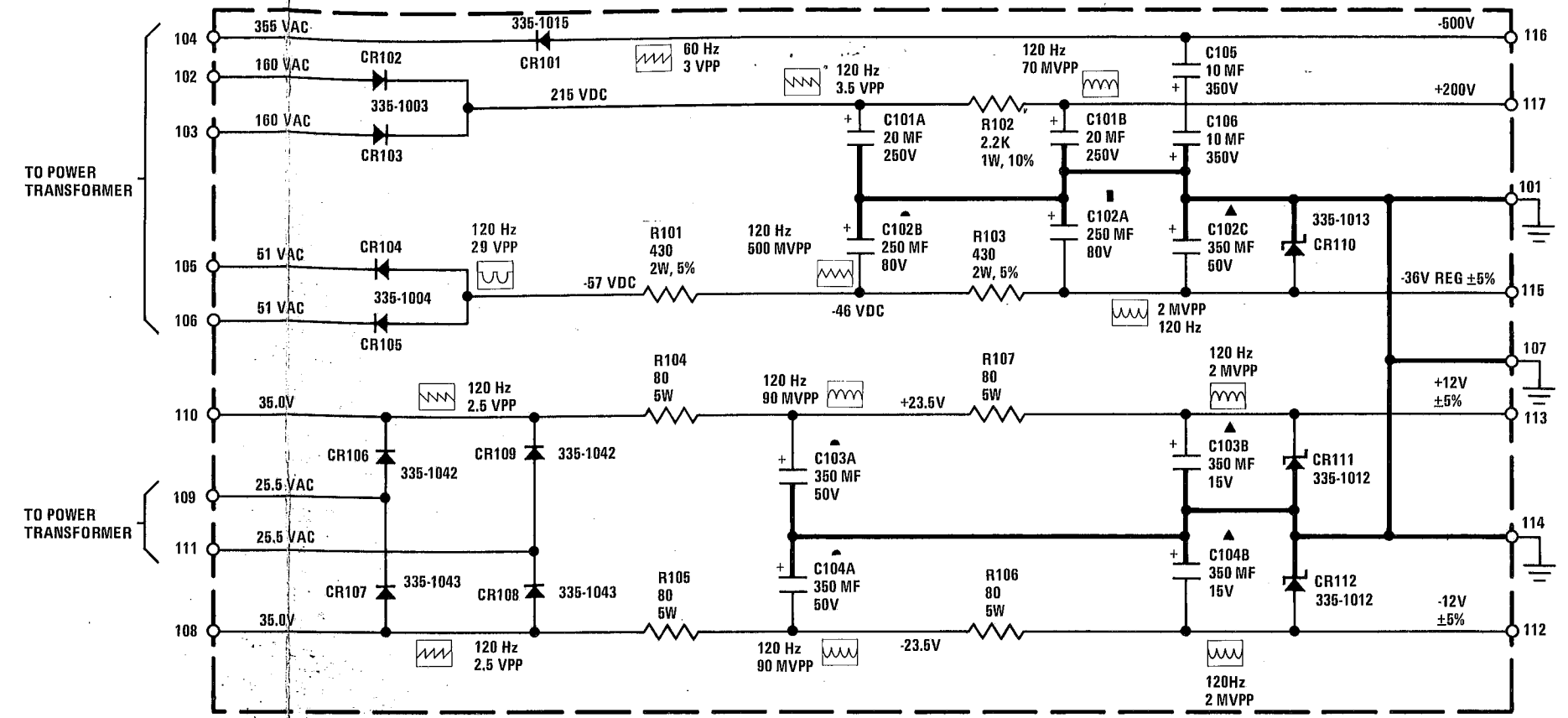


FIGURE 5C - POWER SUPPLY SCHEMATIC DIAGRAM

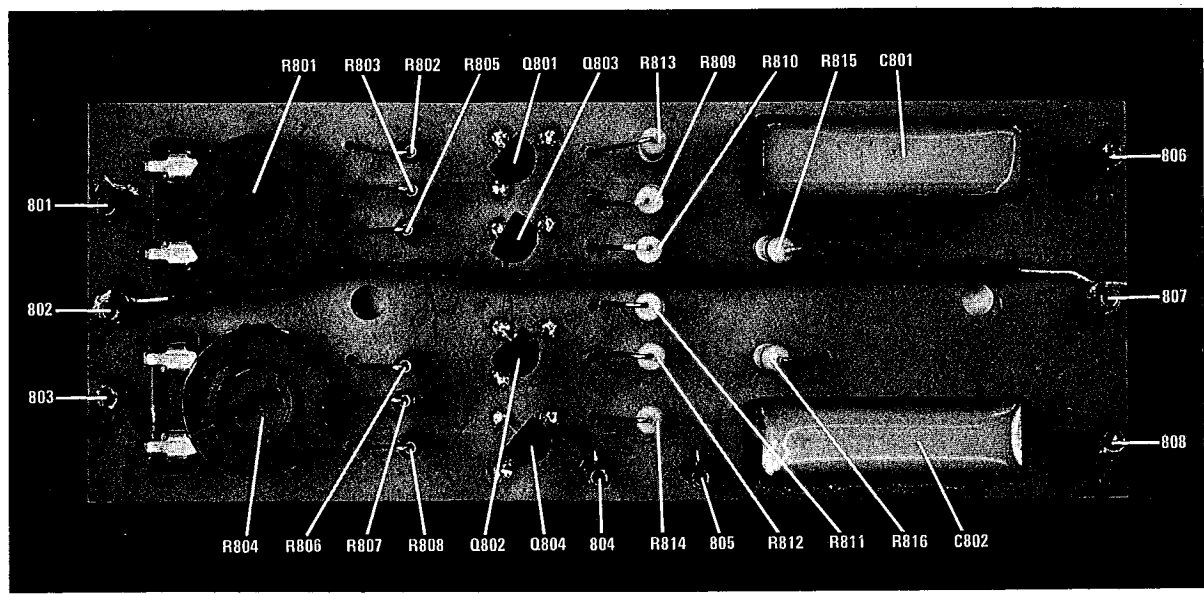


FIGURE 6C - LINE DRIVER COMPONENT DIAGRAM

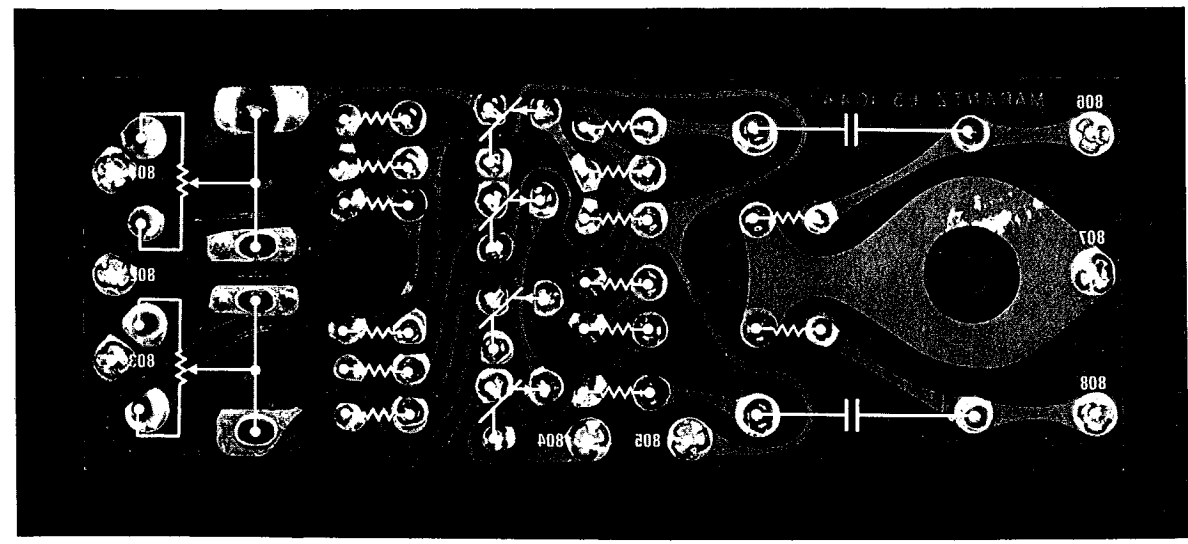


FIGURE 6D - LINE DRIVER CONDUCTOR PATTERN DIAGRAM (AS VIEWED FROM THE COMPONENT SIDE OF BOARD)

3. Set the analyzer to the 1 volt range.
4. Set the FM generator to "monaural" and adjust for 100% modulation, at 400 Hz, 1 K $\mu$ V output.
5. Set Model 20 controls as follows:

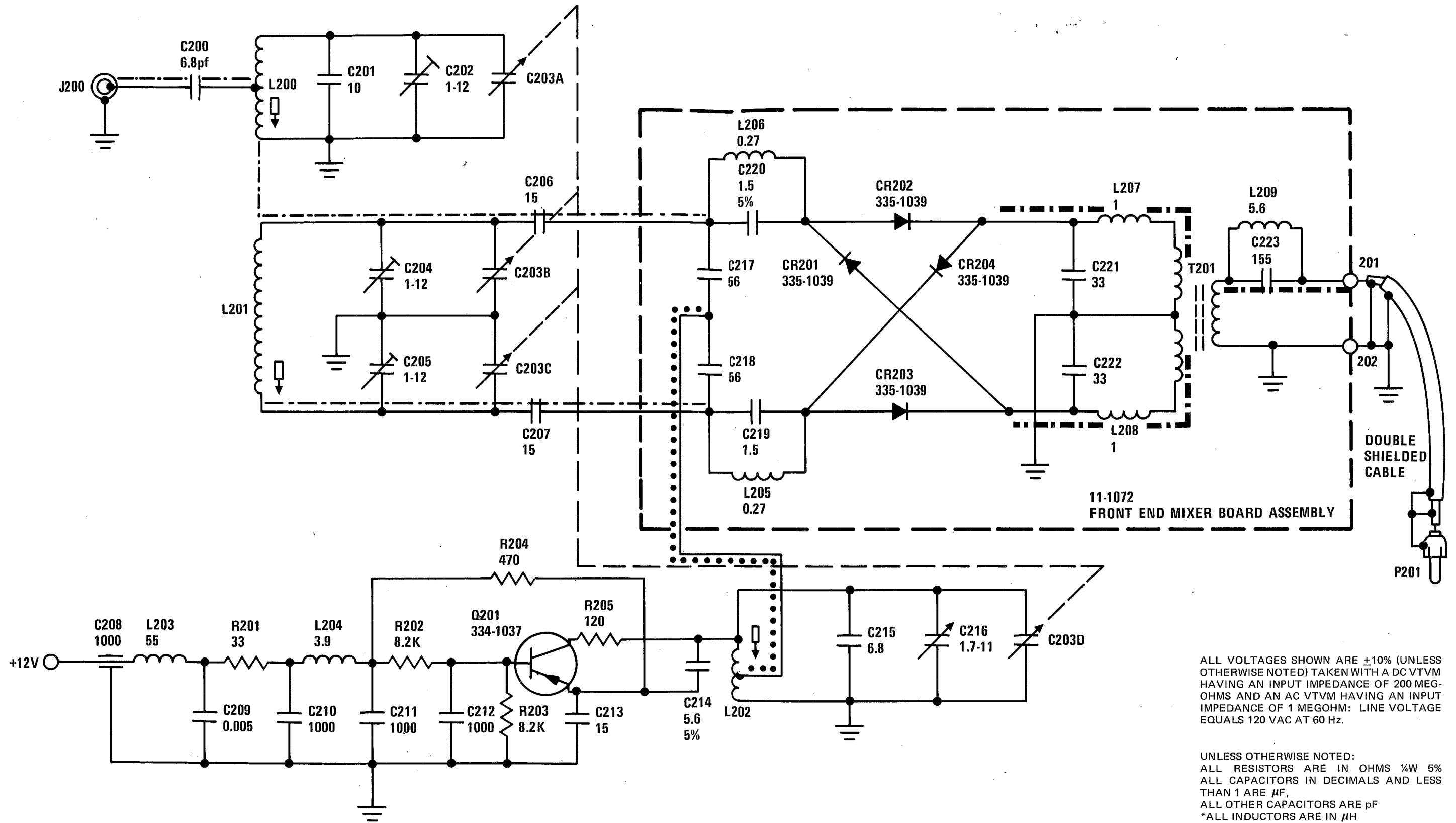
Display - Any Position  
 Muting - Off  
 Mode - Monaural

6. "Fine tune" the Model 20 to the generator's frequency.

7. Adjust R801 for a 1.00 volt reading on the distortion analyzer.
8. Move the distortion analyzer to the channel B (right) "AUDIO OUTPUT" jack.
9. Adjust R804 for a 1.00 volt reading on the distortion analyzer.

**NOTE**

If the customer has reset the output levels to suit his own needs, select the channel with the highest voltage output and adjust the output level of the lower channel up to match it.



ALL VOLTAGES SHOWN ARE  $\pm 10\%$  (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM; LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS  $\frac{1}{4}W$  5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE  $\mu F$ ,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN  $\mu H$

●●●●● LOCAL OSCILLATOR SIGNAL PATH  
 - - - - - RF PRIMARY SIGNAL PATH  
 ■■■■■ 10.7 MHz OUTPUT

FIGURE 7A - MODEL 20 FRONT END SCHEMATIC DIAGRAM

FRONT END ADJUSTMENTS

The Model 20 front end is a "state-of-the-art" assembly which has limited field serviceability. In the event the front end proves defective, normal trouble shooting methods may be used to locate the defective component. It should be noted, however, that during trouble shooting and especially during parts replacement, that **EXTREME ATTENTION** be given to seemingly small, but often times very important details. Such "small" things as the size and placement of certain solder joints, the placement and shape of leads and the position of one part relative to another, could degrade items not normally measured at service facilities; such as image rejection, spurious responses, etc.

In the event field parts replacement is done, the receiver should be carefully checked for performance to determine if realignment is necessary. **DO NOT** attempt alignment yourself. Return the front end to the factory along with the dial strip where it will be realigned and matched to the "custom drilled" dial strip.

If "dial tracking" only is off, determine if the error is evenly distributed across the dial, i.e., the dial pointer misses the 1 MHz dial scale marks by the same distance at each mark. If so "break loose" the dial pointer **CAREFULLY** from the dial string (it's cemented in place) and slide the string. When error is corrected, re-cement it to the dial string with "EASTMAN" No. 910, "LOCTITE" No. 404 or equivalent.

If the error is not the same at all places on the dial but is greater at the lower on upper end, slight retouching of L207 (for low end of band) and C218 (for high end of band) should be tried.

NOTE

Although L207 will effect the "low end" of the band the most, etc., there is an interaction between L207 and C218 that must be corrected for by trial and error.

If it is found that a large mistracking exist, return to factory.

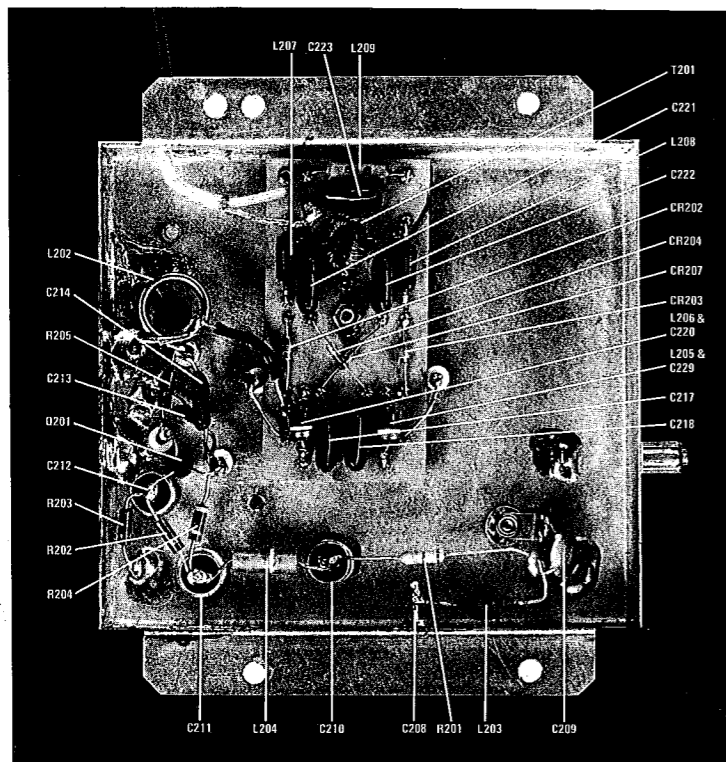


FIGURE 7B - MODEL 20 FRONT END TOP VIEW DIAGRAM

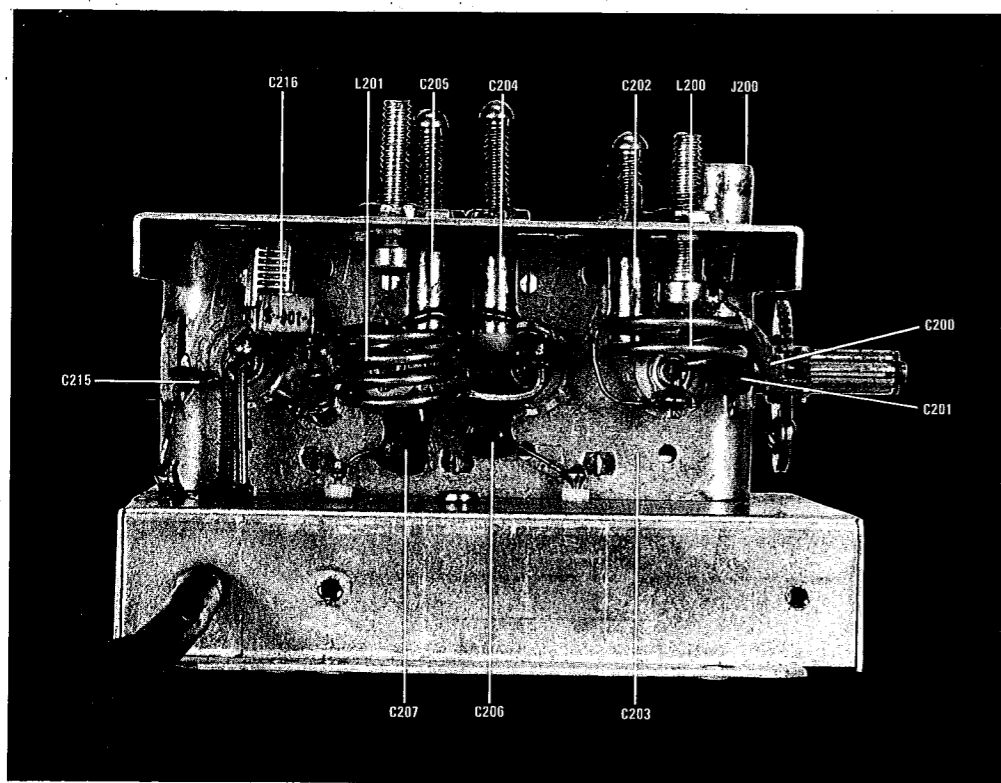


FIGURE 7C - MODEL 20 FRONT END BOTTOM VIEW DIAGRAM

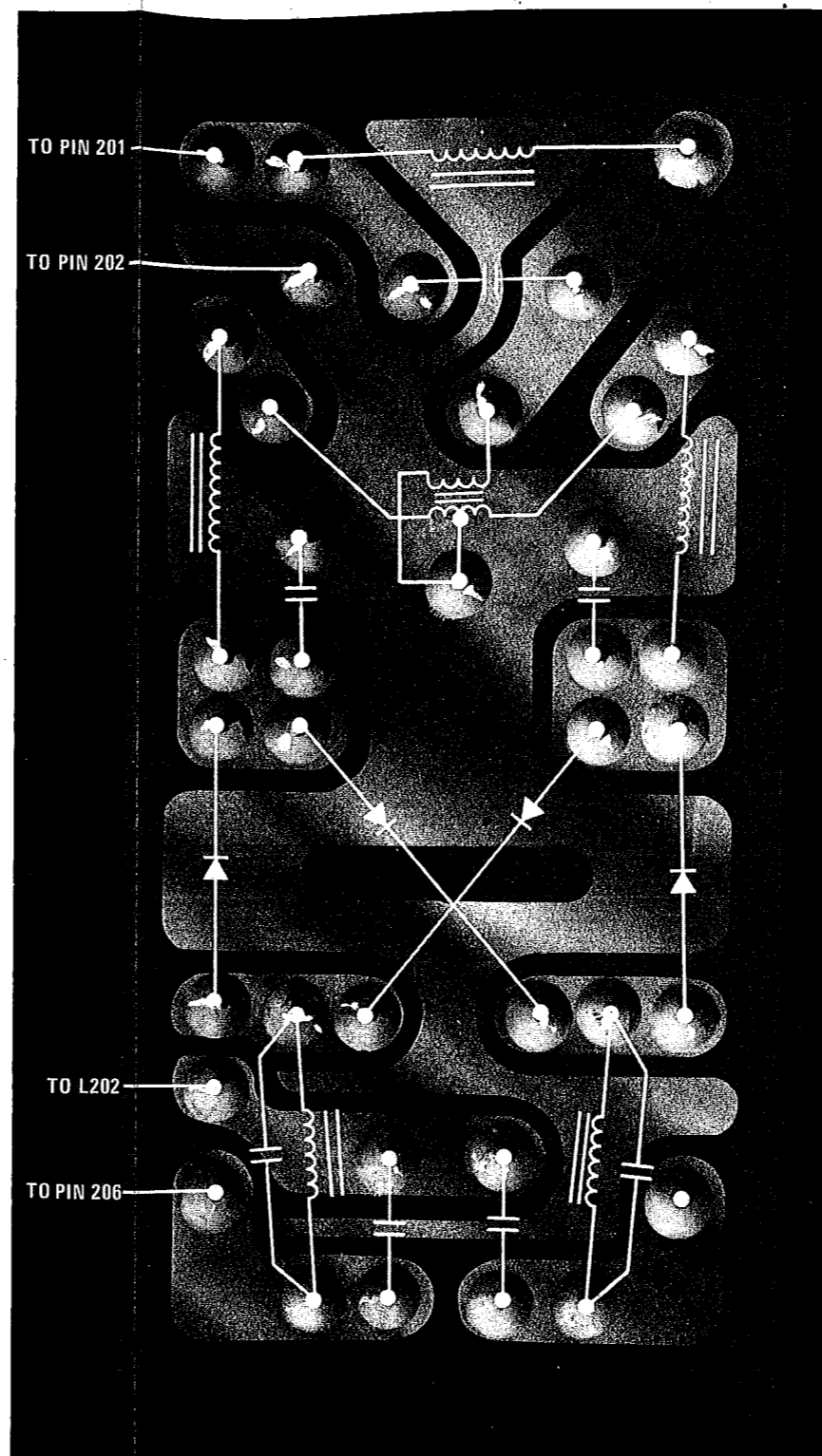


FIGURE 7D - 20 FRONT END MIXER CIRCUIT DIAGRAM  
( AS VIEWED FROM COMPONENT SIDE OF BOARD )



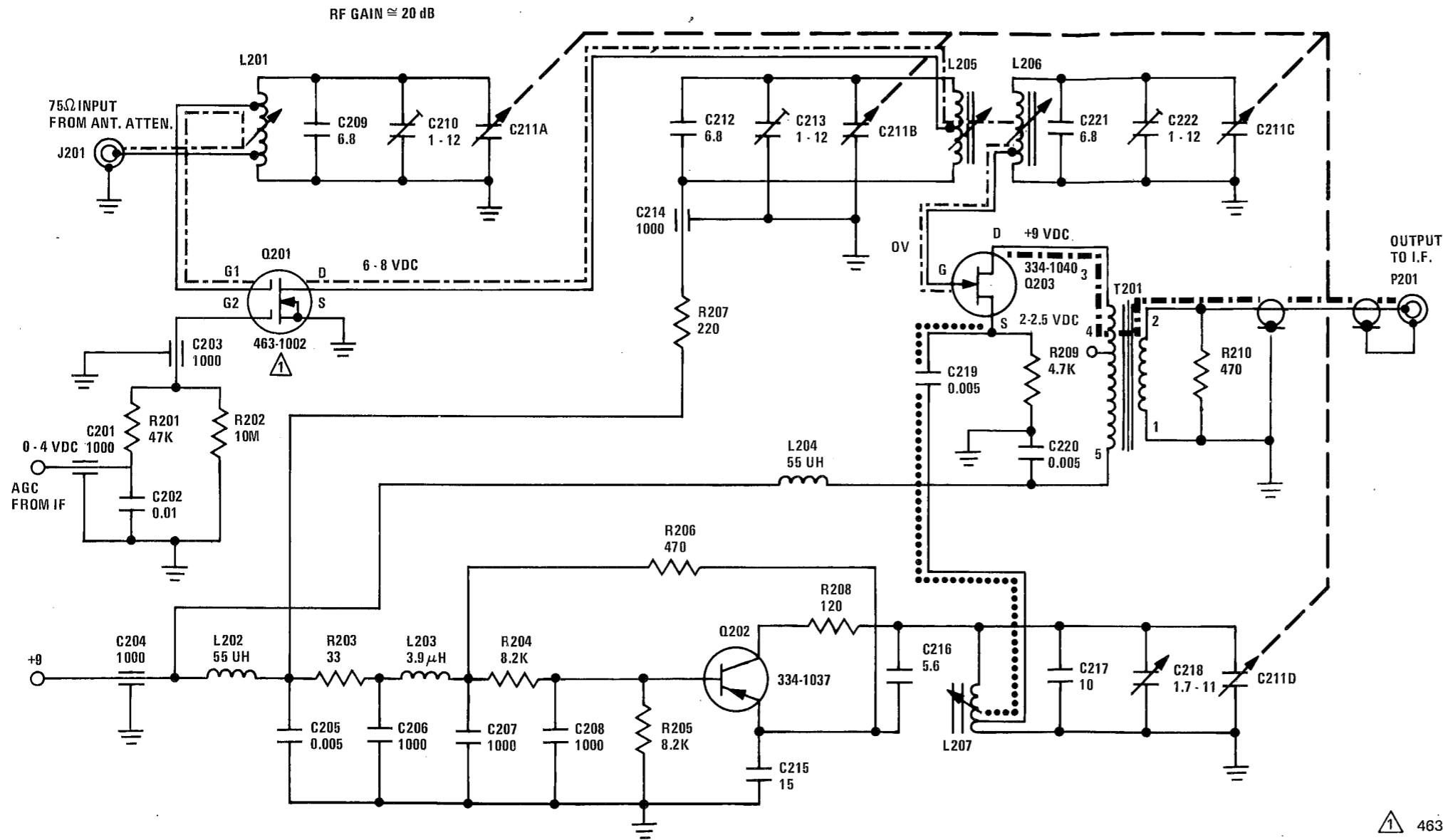


FIGURE 8A - FRONT END SCHEMATIC DIAGRAM MODEL 20B

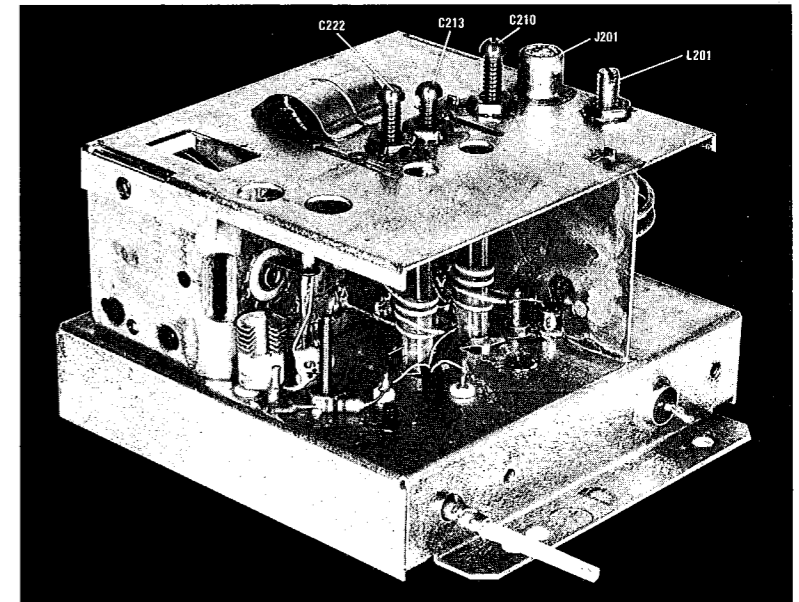


FIGURE 8B - FRONT END OVERVIEW

⚠ 463-1002 IS THE RECOMMENDED FIELD REPLACEMENT PART NUMBER. THE ORIGINAL PART NUMBER IS 334-1038.

- LOCAL OSCILLATOR SIGNAL PATH
- RF PRIMARY SIGNAL PATH
- ■ ■ ■ ■ 10.7 MHz OUTPUT

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS ¼W 5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE μF,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN μH

ALL VOLTAGES SHOWN ARE ±10% (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

## FRONT END ADJUSTMENTS

The Model 20B front end is a "state-of-the-art" assembly which has limited field serviceability. In the event the front end proves defective, normal trouble shooting methods may be used to locate the defective component. It should be noted, however, that during trouble shooting and especially during parts replacement, that **EXTREME ATTENTION** be given to seemingly small, but often times very important details. Such "small" things as the size and placement of certain solder joints, the placement and shape of leads and the position of one part relative to another, could degrade items not normally measured at service facilities; such as image rejection, spurious responses, etc.

In the event field parts replacement is done, the receiver should be carefully checked for performance to determine if realignment is necessary. **DO NOT** attempt alignment yourself. Return the front end to the factory along with the dial strip where it will be realigned and matched to the "custom drilled" dial strip.

If "dial tracking" only is off, determine if the error is evenly distributed across the dial, i.e., the dial pointer misses the 1 MHz dial scale marks by the same distance at each mark. If so "break loose" the dial pointer **CAREFULLY** from the dial string (it's cemented in place) and slide it down the string. When error is corrected, re-cement it to the dial string with "EASTMAN" No. 910, "LOCTITE" No. 404 or equivalent.

If the error is not the same at all places on the dial but is greater at the lower on upper end, slight retouching of L202 (for low end of band) and C216 (for high end of band) should be tried.

## NOTE

Although L202 will effect the "low end" of the band the most, etc., there is an interaction between L202 and C216 that must be corrected for by trial and error.

If it is found that a large mistracking exist, return to factory.

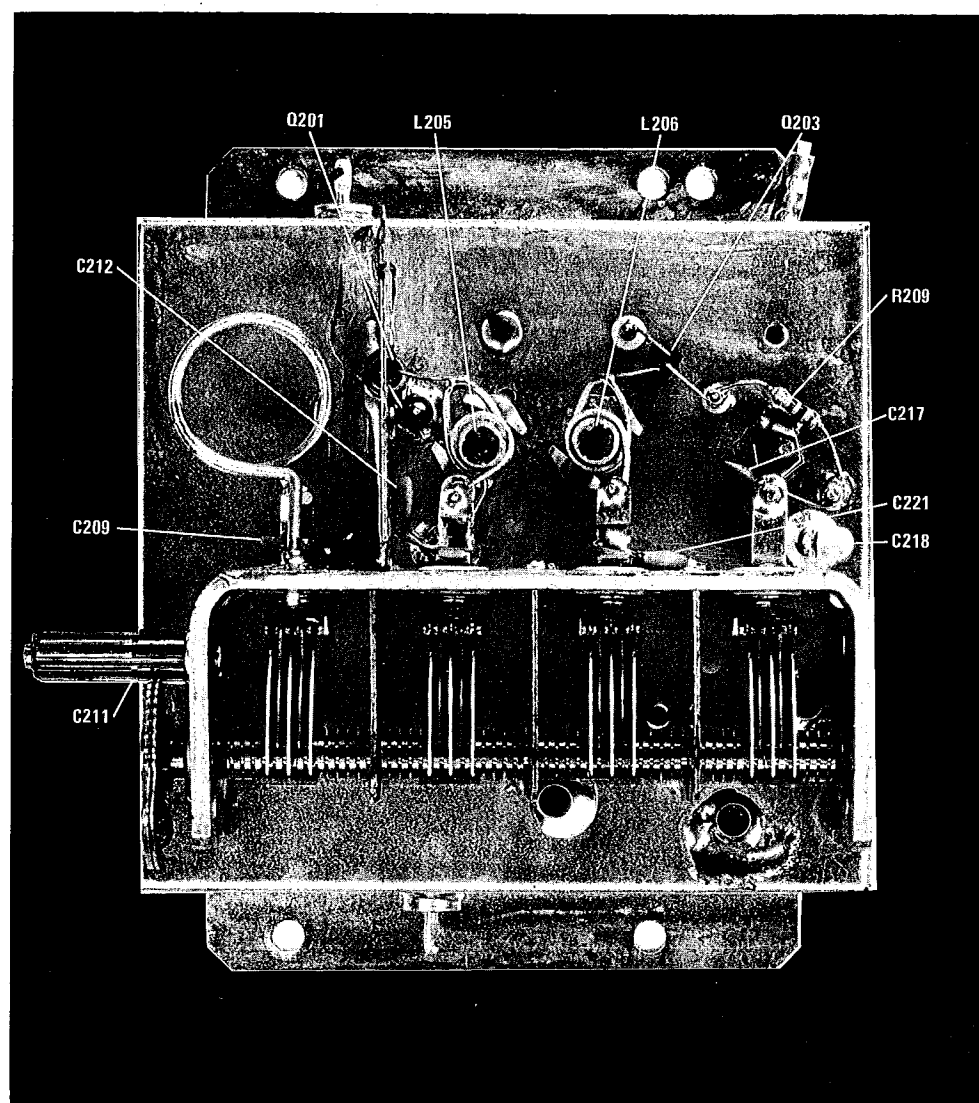


FIGURE 8C - FRONT END TOP VIEW DIAGRAM MODEL 20B

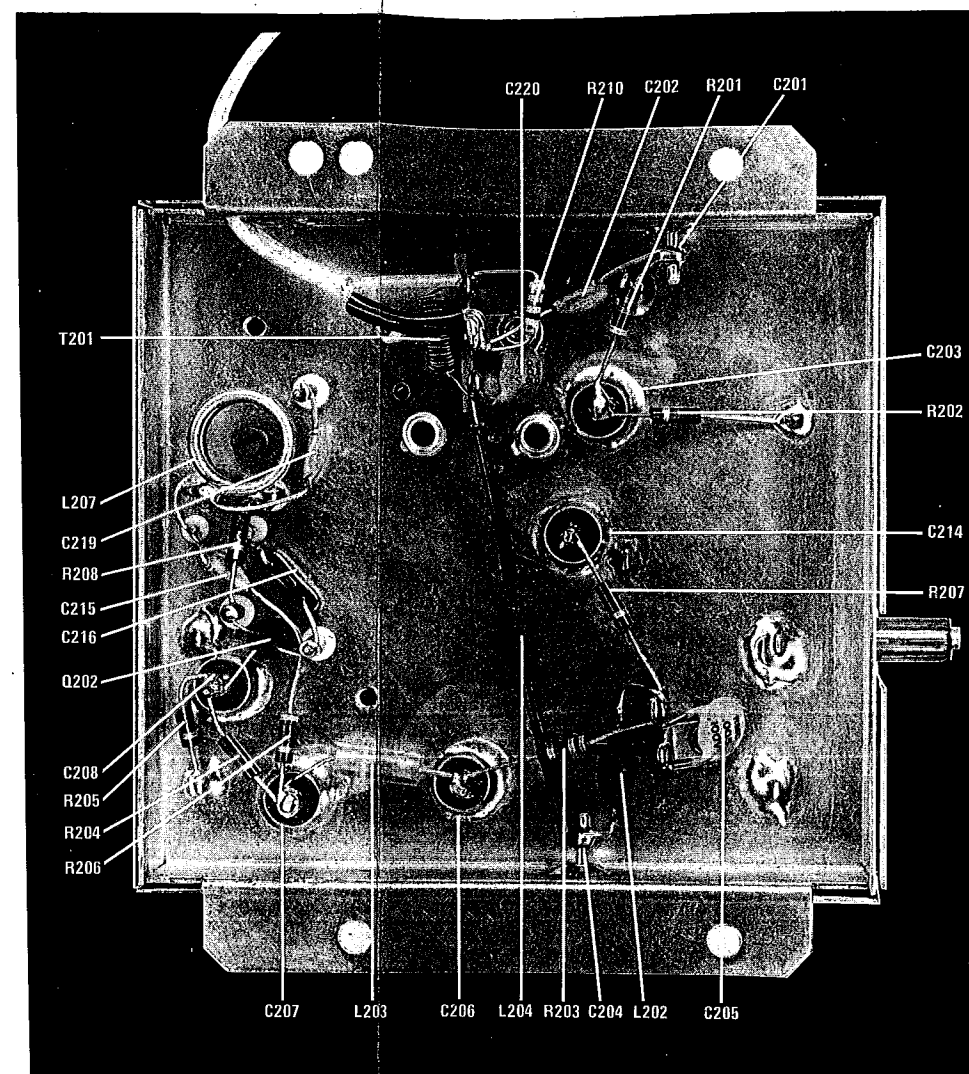


FIGURE 8D - FRONT END BOTTOM VIEW DIAGRAM MODEL 20B

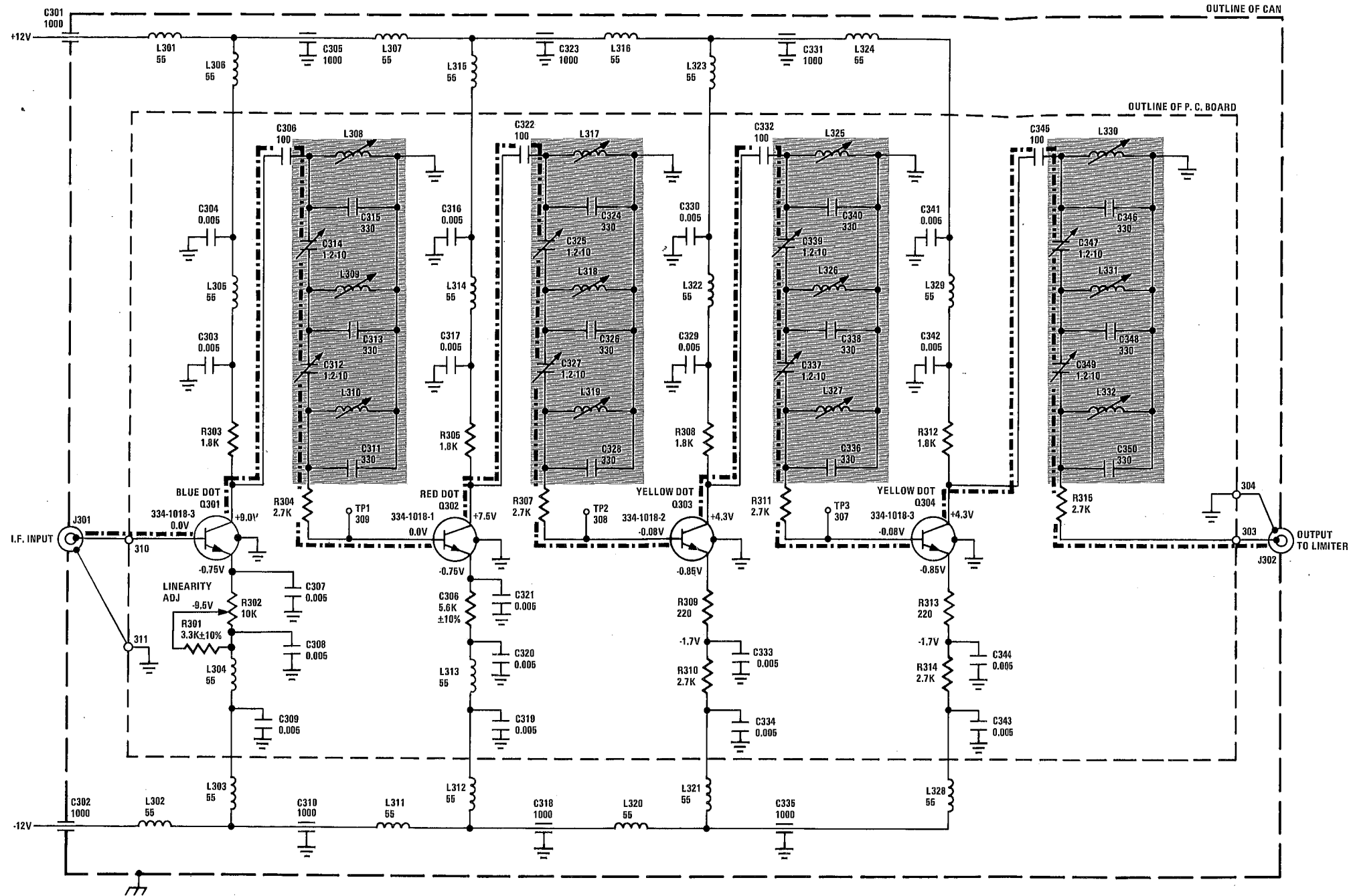


FIGURE 9A - I.F. SCHEMATIC DIAGRAM MODEL 20

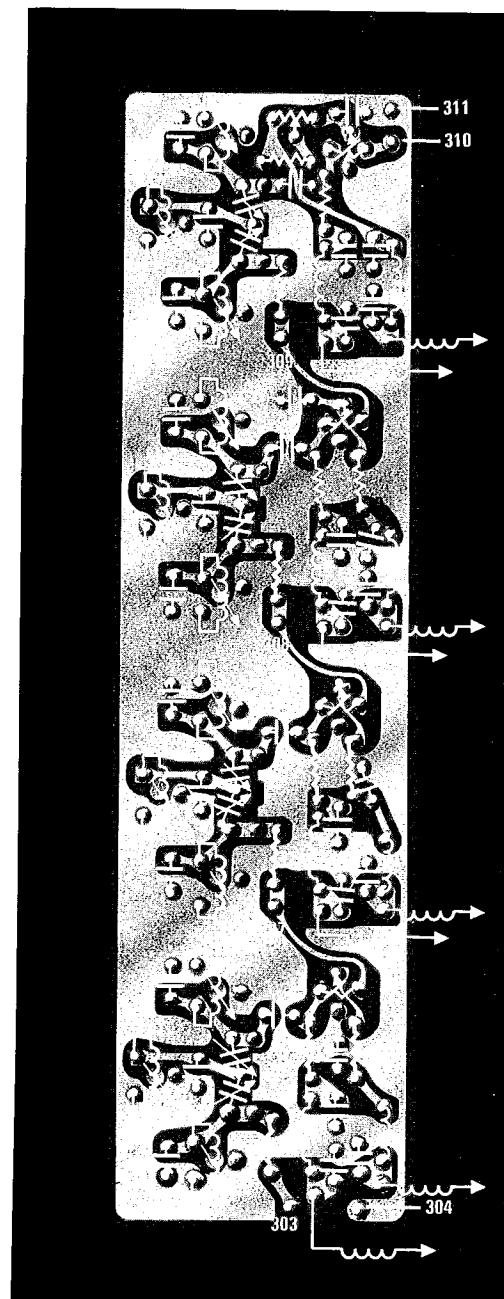


FIGURE 9B - MODEL 20 I.F. CONDUCTOR DIAGRAM

ALL VOLTAGES SHOWN ARE  $\pm 10\%$  (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS  $\frac{1}{4}W$  5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE  $\mu F$ ,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN  $\mu H$

----- 10.7 MHz SIGNAL PATH

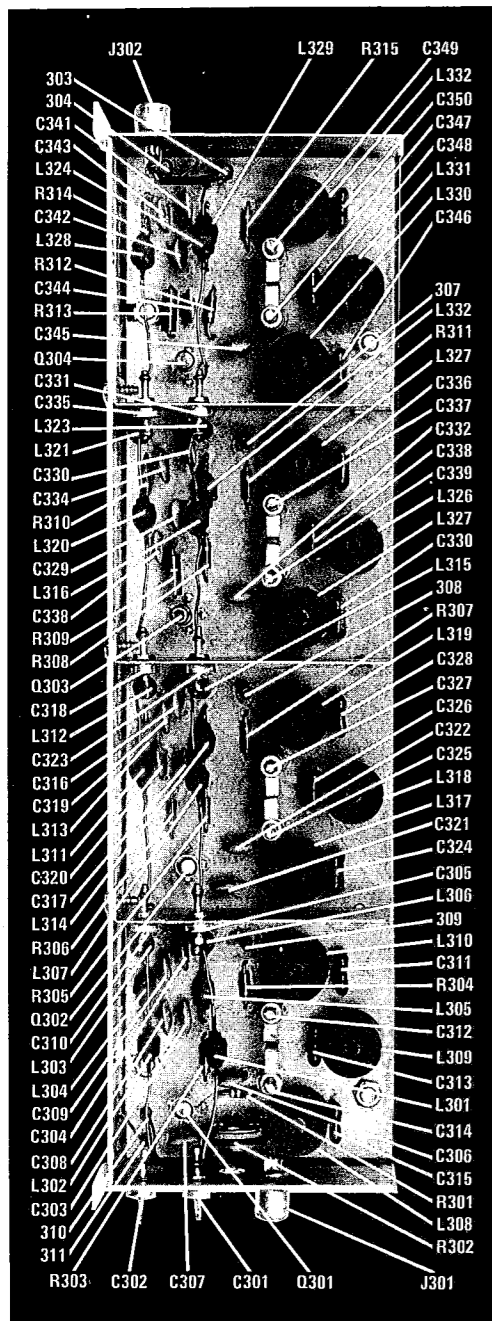


FIGURE 9C - MODEL 20 I.F. COMPONENT DIAGRAM

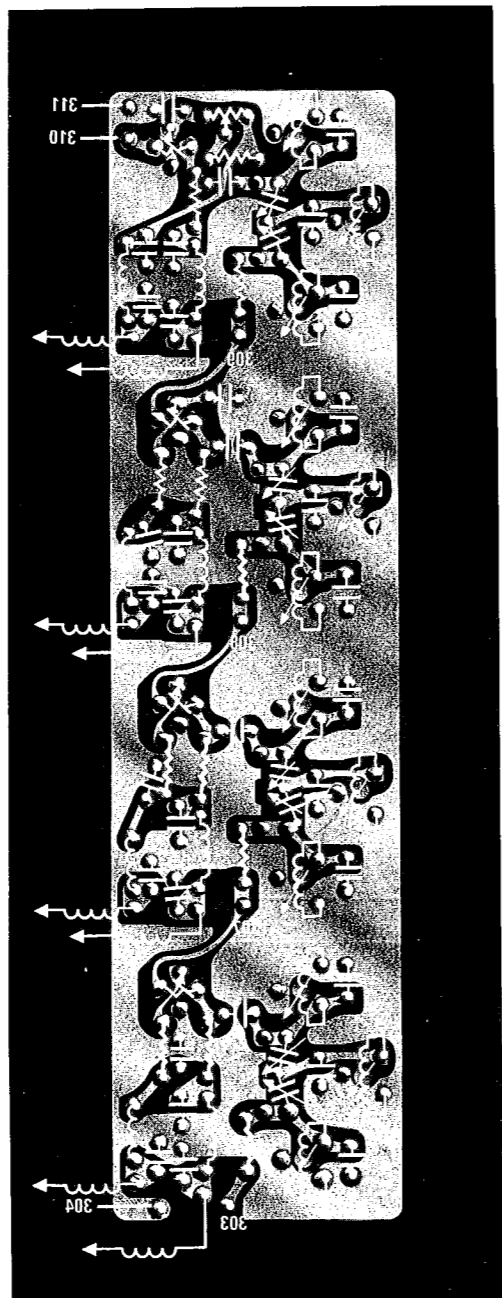


FIGURE 9D - MODEL 20 I.F. CONDUCTOR PATTERN DIAGRAM (AS VIEWED FROM COMPONENT SIDE OF BOARD)

## IF ALIGNMENT

Note: Most I.F. components not directly in the actual "filter" section may be replaced (with great care) without causing need for realignment. "Filter" sections are the shaded areas on the schematic.

The following Field I.F. Alignment Procedure is intended for use only for emergencies and under conditions where return of the I.F. Assembly to the factory for alignment would be considered impossible. If, under normal conditions, it is felt that the I.F. requires realignment, return it to the factory.

### A. Preliminary Setups

1. Construct an adaptor as shown in Figure A.
2. Obtain an extra I.F. cover and modify per Figure E.
3. Remove I.F. cover and install alignment cover (see Step 2 above).
4. Install adaptor (see Step 1) in the output jack of the I.F. and reconnect output cable to the adaptor. Also, connect a length of coax (with proper plugs) to the second jack of the adaptor. This will come into use later.

### NOTE

It must be long enough and of the proper type to reach and connect to the vertical input of the Scope.

5. Make the test setup shown in Figure B.
6. Disconnect the I.F. input from the Front End and connect a 10.7 MHz crystal oscillator to it.
7. Turn on set to be aligned and allow it and the test equipment to "warm up" for at least 30 minutes.
8. Set Scope Horizontal Input to D.C. and short the input. Adjust the position control until the trace is centered exactly.
9. Adjust VTVM for a "ZERO" reference point (with input shorted) at mid scale.
10. Remove input shorts on the equipment and turn on the 10.7 MHz oscillator.
11. The meter should read zero (0) volts and the scope trace should be centered horizontally.
12. Remove the 10.7 MHz oscillator and reconnect the Front End to the I.F. input.
13. Tune the Receiver to some clear portion of the band near 98 MHz.

14. Set the FM Generator 10 K  $\mu$ V output, Monaural, with 100% modulation at 400 Hz and tune it to the frequency of the receiver and adjust it carefully for zero (0) volts on the VTVM.

### B. Alignment

1. Connect a standard X1 probe to the Channel 2 Input (Tektronics Model 422-Pull the invert switch and the X10 gain switches; Model 503-Use the Minus (-) input) and connect the probe to TP-1 in the I.F. Connect the ground clip to the shield between the first and second stage.
2. Switch the generator to "Dual Sweep" and set the sweep width control to 500 kHz and adjust the phase control for a single display on the scope.
3. Adjust the Horizontal Scope Gain so that the trace covers exactly 10 divisions and adjust the Vertical Scope Gain so that the trace is 4 to 5 divisions high.
4. The curve should appear approximately as in Figure C. If not, start by unscrewing the two trimmers marked as Adj. 2 and Adj. 4 in Figure F until the curve gets smaller. Then adjust Adj. 1, Adj. 3 and Adj. 5 for maximum height at 10.7

MHz (horizontal center of scope). The sides of the curve (10.5, 10.6, 10.8 and 10.9 MHz) should be symmetrically positioned. Now screw in Adj. 2 and Adj. 4 to flatten the top of the curve and re-adjust Adj. 3 and Adj. 5 to correct for tilt.

### NOTE

The procedure just outlined is intended only as a guide to help in properly aligning the stage. Minor retouches in one or more adjustments may be necessary to obtain the desired shape. As a rule of thumb, Adj. 1 affects the upper left side of the curve and Adj. 5 the upper right side.

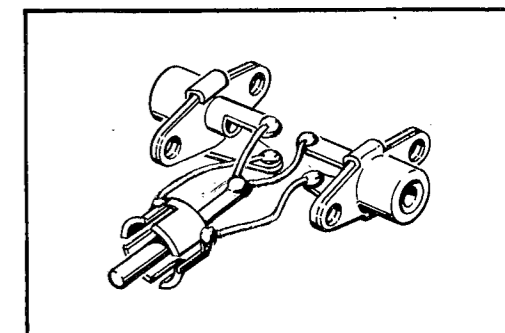


FIGURE A. I.F. OUTPUT ADAPTOR

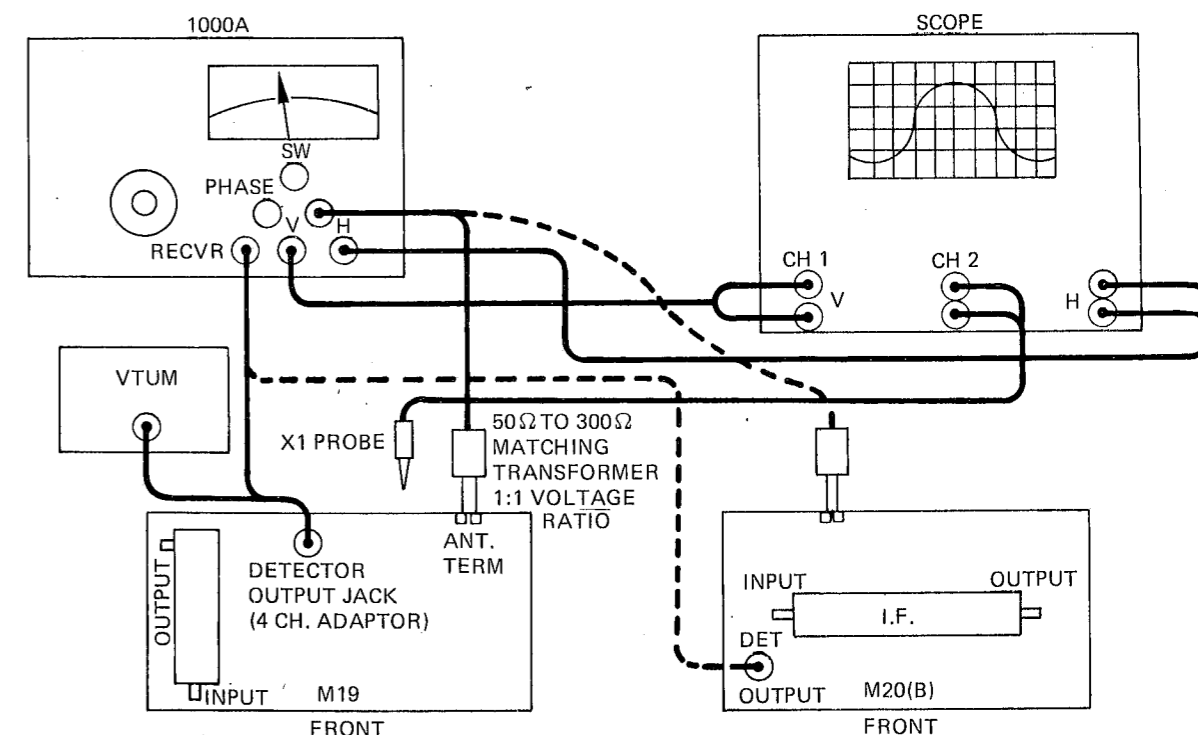


FIGURE B. I.F. ALIGNMENT TEST SET-UP

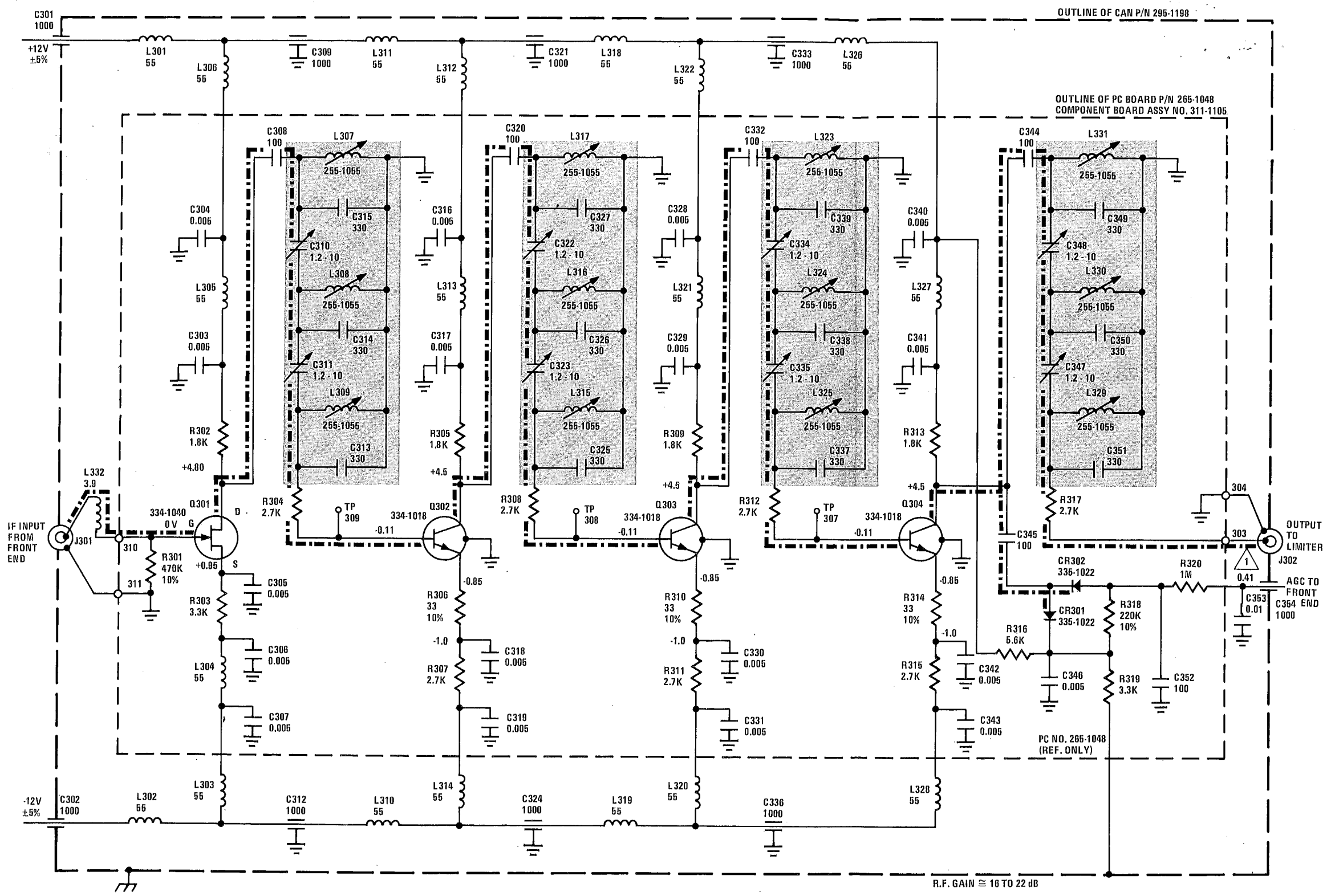


FIGURE 10A - MODEL 20B I.F. SCHEMATIC DIAGRAM

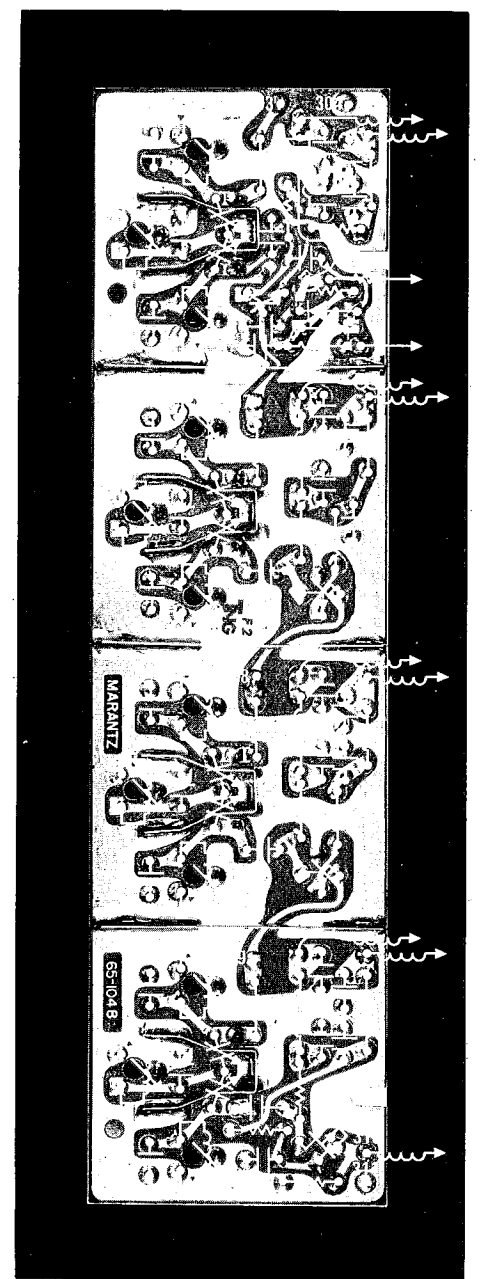


FIGURE 10B - MODEL 20B I.F. CONDUCTOR DIAGRAM

--- 10.7 MHz SIGNAL PATH  
 ▲ AGC VOLTAGE VARIES WITH SIGNAL STRENGTH.

ALL VOLTAGES SHOWN ARE ±10% (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM; LINE VOLTAGE EQUALS 120 VAC AT 60 HZ.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS ¼W 5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE μF,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN μH

R.F. GAIN ≅ 16 TO 22 dB



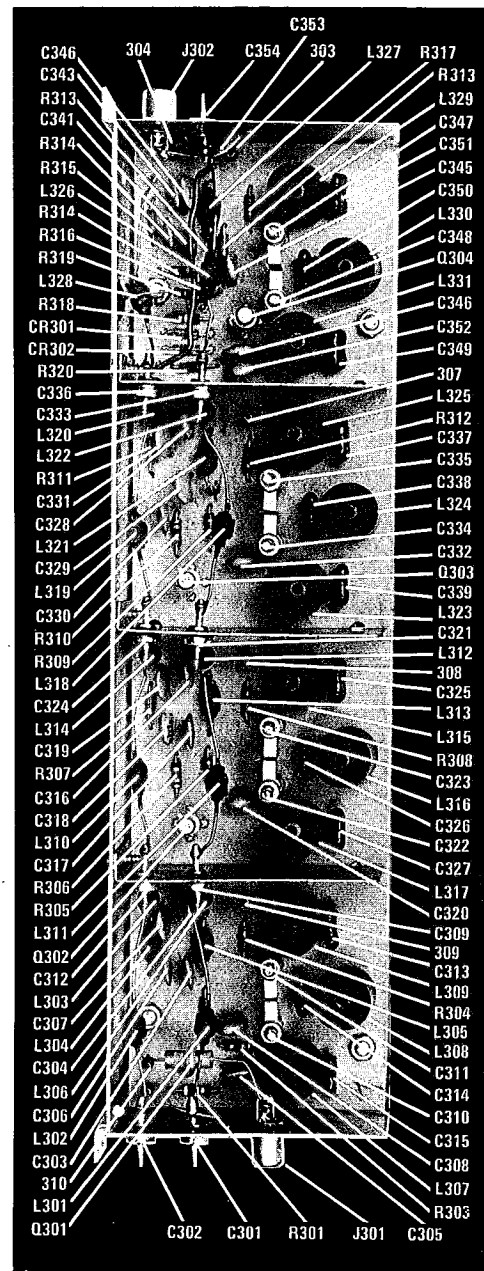


FIGURE 10C - MODEL 20B I.F. COMPONENT DIAGRAM

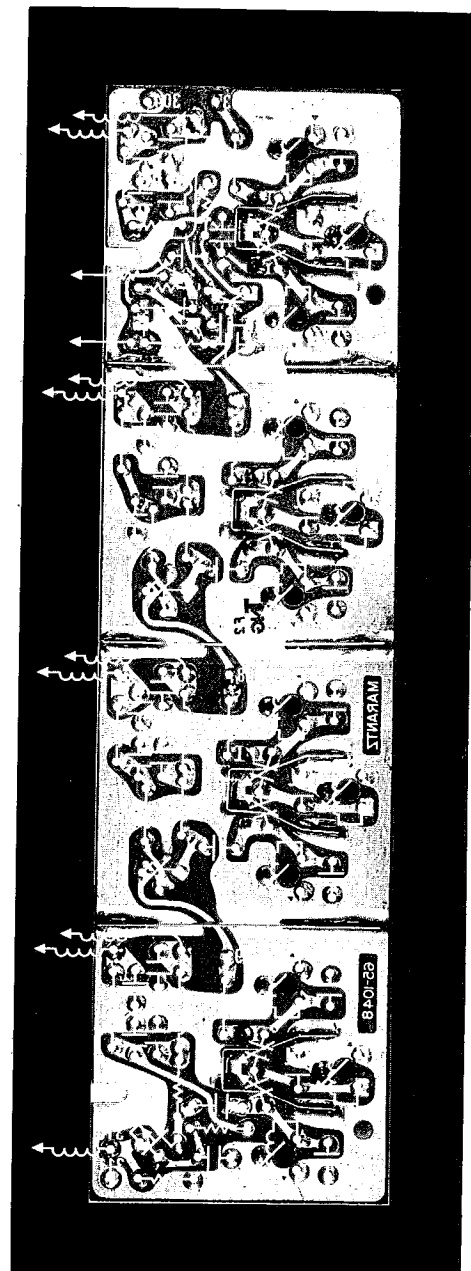


FIGURE 10D - I.F. CONDUCTOR PATTERN DIAGRAM MODEL 20B (AS VIEWED FROM THE COMPONENT SIDE OF BOARD)

- Reduce the sweep width to 200 kHz and check the curve against Figure D. Retouch adjustments slightly for proper shape and then recheck for the response curve in Figure C at 500 kHz sweep width. Readjust as necessary - continue checking both curves and readjusting slightly until no further improvements can be made.

NOTE

Recheck receiver "tuning" - See Section A, Step 14.

- Move the scope probe to TP-2 (Ground clip to the shield between the second and third stage) and repeat Steps 3, 4 and 5 for the second stage.

NOTE

This curve shows the response of the first and second stage. Therefore, the response curve can not be any better than that

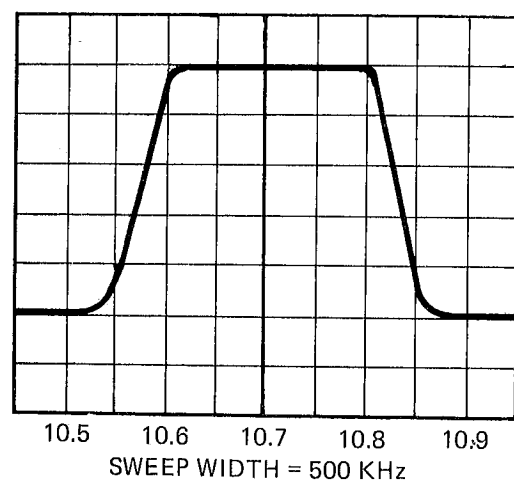


FIGURE C. I.F. BANDPASS CURVE

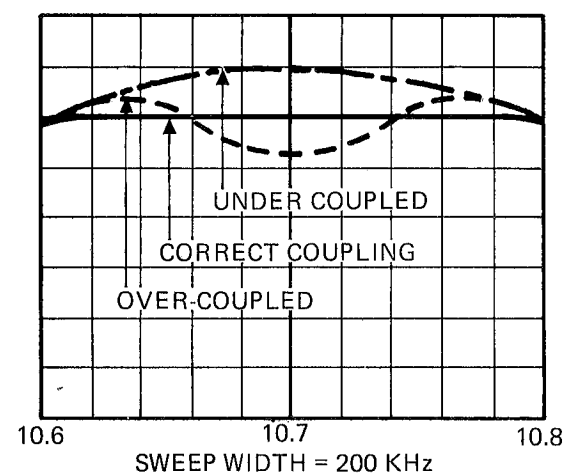


FIGURE D. I.F. BANDPASS CURVE

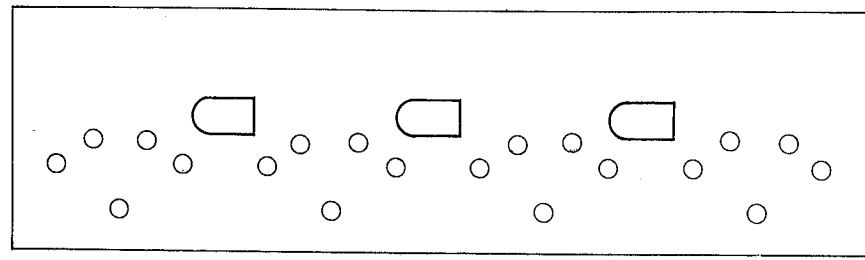


FIGURE E. I.F. ALIGNMENT COVER MODIFICATION

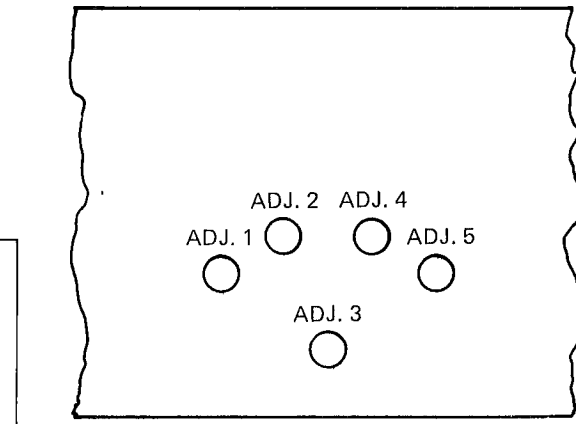
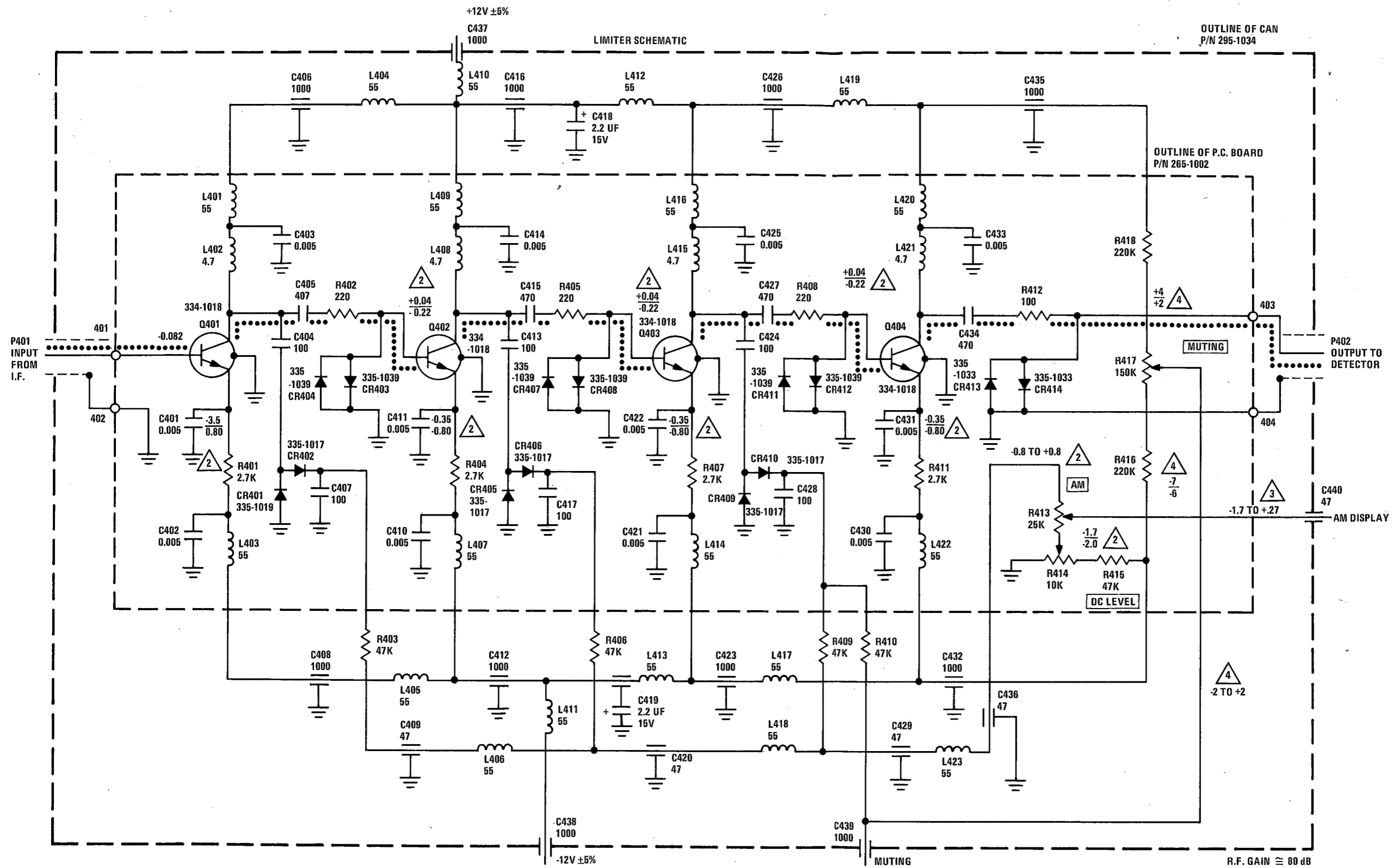


FIGURE F. M19, 20 & 20B ADJUSTMENT LOCATIONS (TYPICAL OF ONE STAGE)

- Move the scope probe to TP-3 (Ground clip to the shield between the third and fourth stage) and repeat Steps 3, 4 and 5 for the third stage.
- Disconnect the scope probe from the scope input and replace it with the coax type cable from the output adaptor (see Section A - Step 4).
- Repeat Steps 3, 4 and 5 for the fourth stage.
- Remove all adaptors and connectors, etc., and restore receiver to operating condition.
- Perform the Detector and MPX Alignments and check the receiver for overall performance.





- △ RANGE OF VOLTAGE AT THESE POINTS DETERMINED BY SIGNAL STRENGTH.
- ③ VOLTAGES SHOW VARY WITH SETTINGS OF AM DISPLAY AND DC LEVEL POTS.
- △ VOLTAGES SHOWN VARY WITH SETTING OF MUTING POT.
- 10.7 MHz SIGNAL PATH (PRIMARY).

FIGURE 11A - LIMITER SCHEMATIC DIAGRAM

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS ¼W 5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE µF,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN µH

ALL VOLTAGES SHOWN ARE ±10% (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60 HZ.

## LIMITER ADJUSTMENTS

Note: Before proceeding with the adjustments contained in the limiter, check or do the adjustments for the detector, scope board and multiplex.

1. Connect F.M. Generator to "ANTENNA" terminals.
2. Connect distortion analyzer to either channel "Audio Output" jack.
3. Set analyzer to 1 volt range.
4. Set F.M. generator to "monaural" and adjust for 100% modulation, at 400 Hz 1 K  $\mu$ V output.
5. Set Model 20 controls as follows: "DISPLAY" - Multipath; "MUTING" - ON; "MODE" - STEREO; "POWER" - ON. Note: Be sure antenna attenuator is in the "out" position.
6. "Fine tune" Model 20 to generator frequency.
7. Lower generator output to 4  $\mu$ V.
8. Adjust the "MUTING POT" (R417) until audio just goes off.
9. Check by reducing generator output to minimum then SLOWLY increase output until audio comes on. This should occur at 6 to 8  $\mu$ V. If not, re-adjust "MUTING POT" slightly to achieve 6 to 8  $\mu$ V demuting.
10. Place the "MUTING" switch in the "OFF" position.
11. Reduce the generator output to 1  $\mu$ V.
12. Adjust the "D.C. LEVEL" pot (R414) until the horizontal line (with some noise - "grass" - riding on it) is just touching the bottom of the screen.
13. Increase generator output to 100 K $\mu$ V (or maximum - whichever is less). CAUTION, HIGH VOLTAGE IS ON SCOPE BOARD NEXT TO LIMITER.
14. Adjust "A.M. DISPLAY" pot (R413) until the horizontal trace just touches the tip of the upper arrow on the scope reticule. Note: Some interaction occurs between R413 and R414. Repeat steps 11 thru 14 until no further adjustment is necessary.

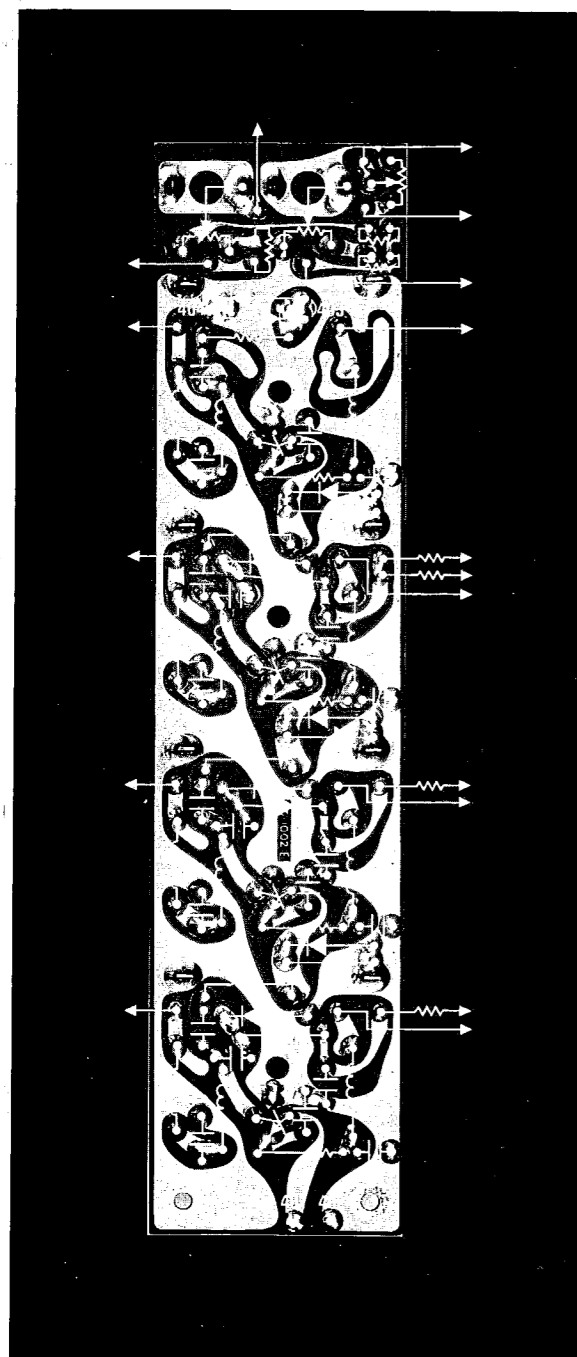


FIGURE 11B - LIMITER CONDUCTOR DIAGRAM

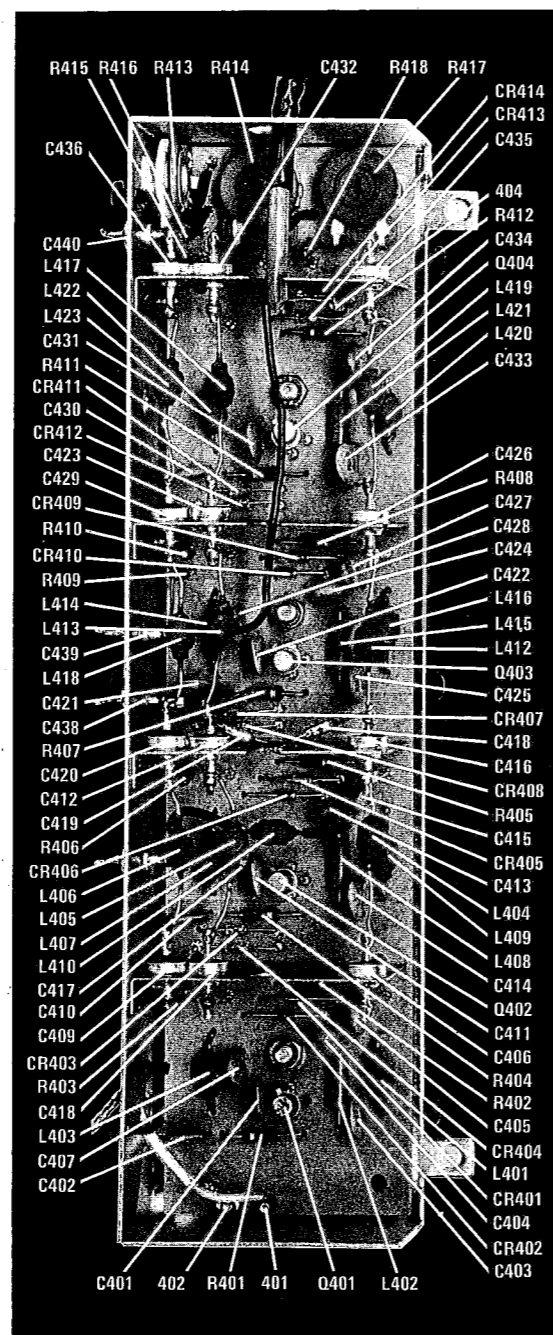


FIGURE 11C - LIMITER COMPONENT DIAGRAM

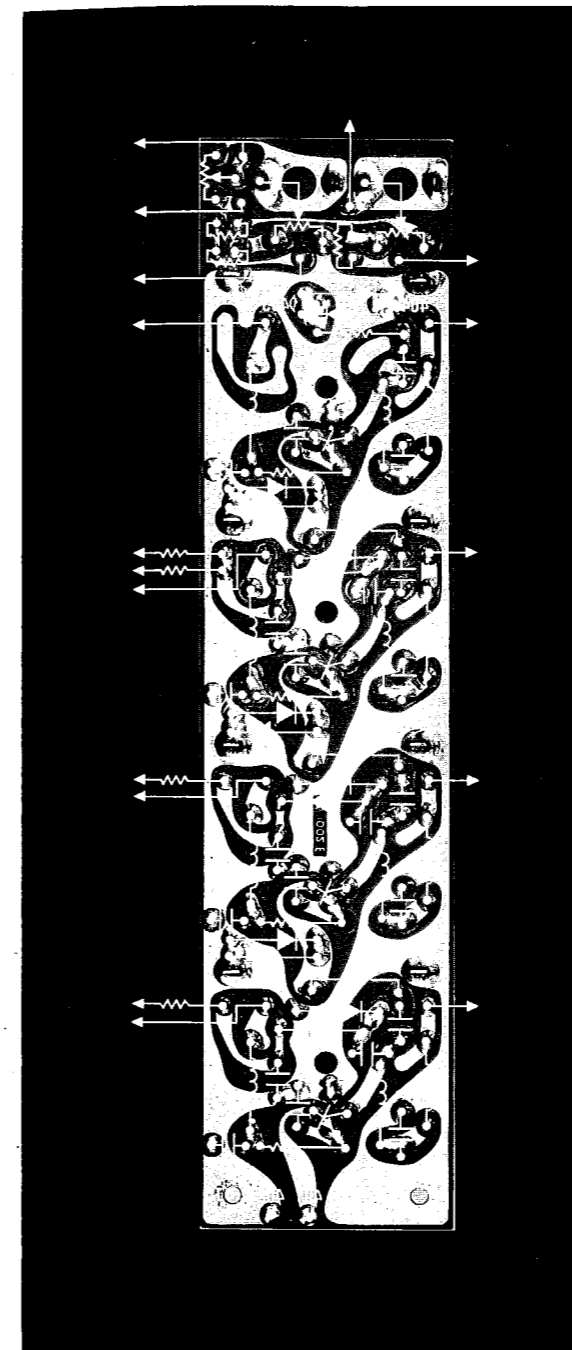


FIGURE 11D - LIMITER CONDUCTOR DIAGRAM  
(AS VIEWED FROM THE COMPONENT SIDE OF BOARD)

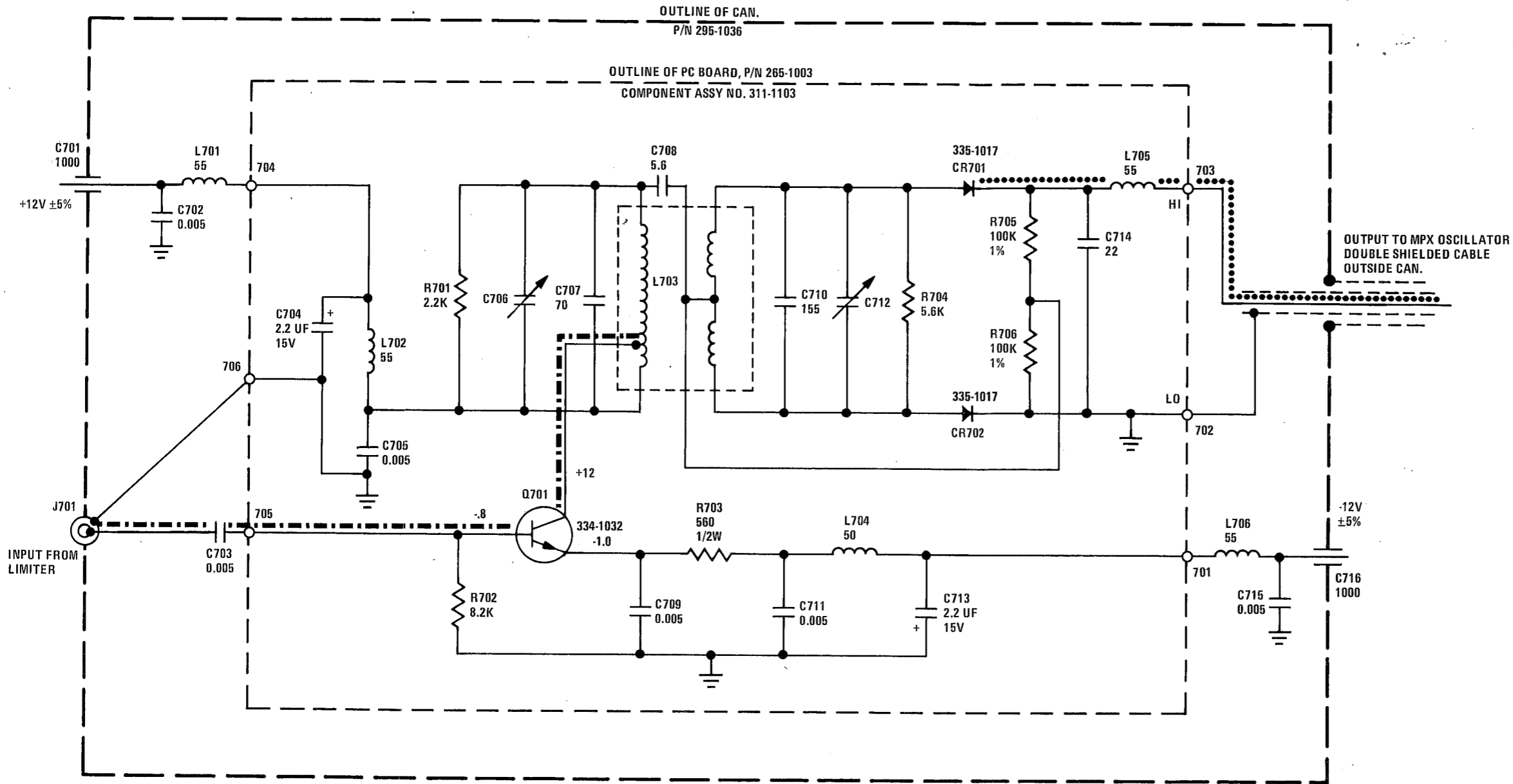


FIGURE 12A - DETECTOR SCHEMATIC DIAGRAM

ALL VOLTAGES SHOWN ARE  $\pm 10\%$  (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS  $\frac{1}{4}W$  5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE  $\mu F$ ,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN  $\mu H$

— — — — — 10.7 MHz SIGNAL PATH (PRIMARY)  
 ● ● ● ● ● AUDIO AND/OR COMPOSITE SIGNAL PATH (PRIMARY)

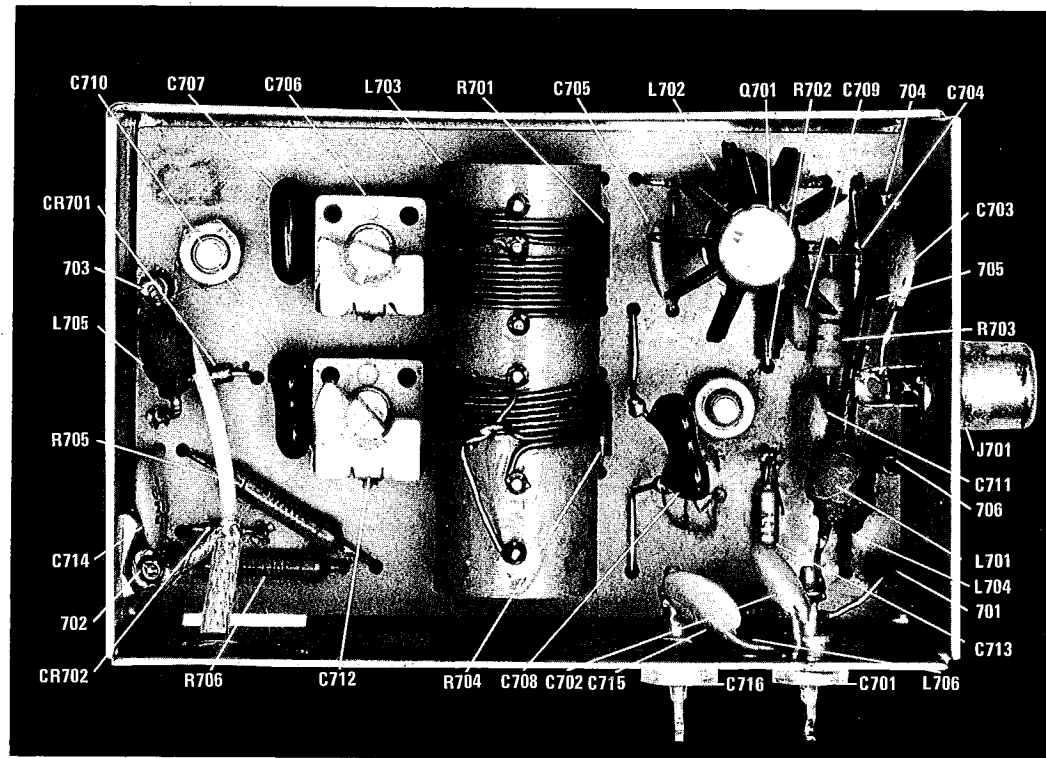


FIGURE 12B - DETECTOR COMPONENT DIAGRAM

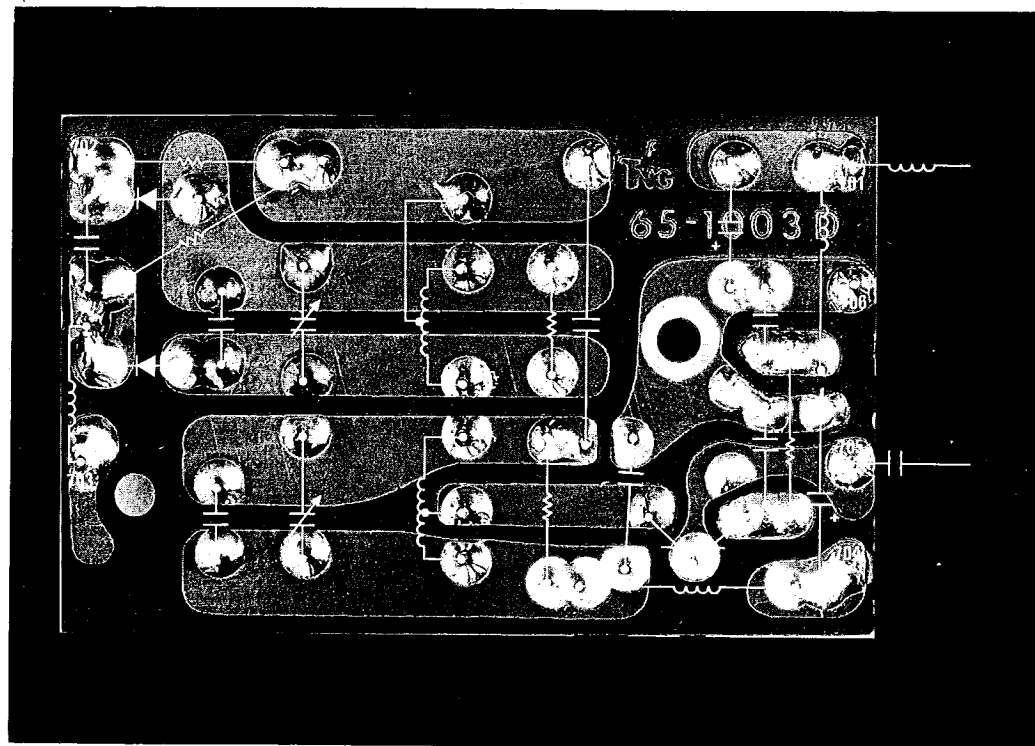


FIGURE 12C - DETECTOR CONDUCTOR DIAGRAM

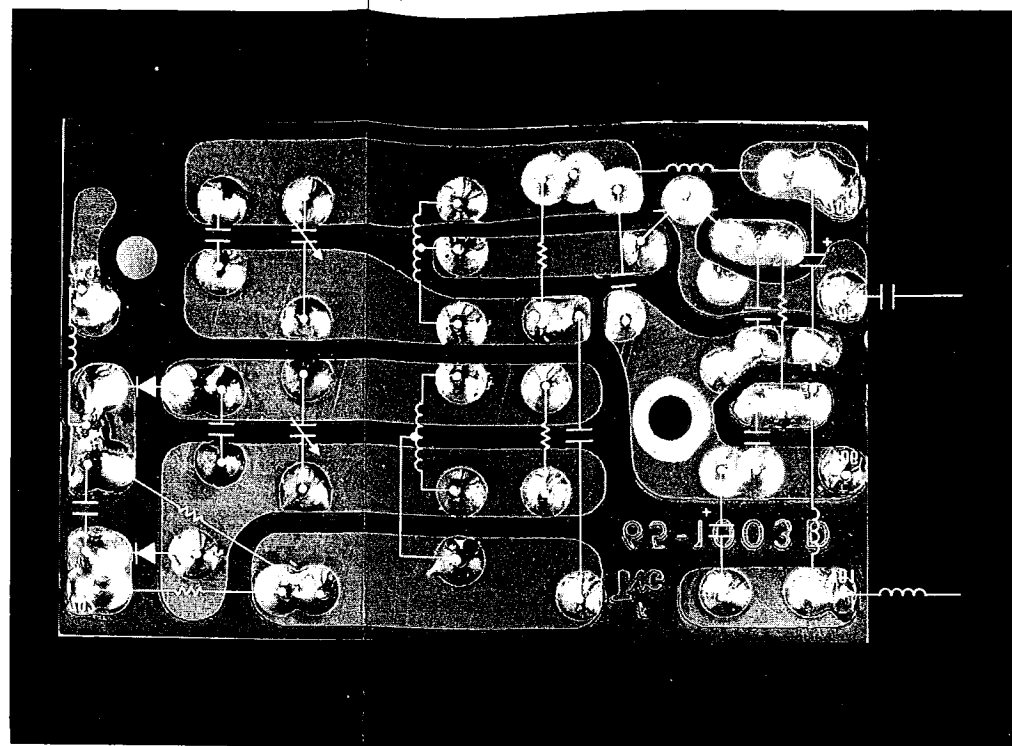


FIGURE 12D - DETECTOR CONDUCTOR PATTERN (AS VIEWED FROM THE COMPONENT SIDE OF BOARD)

DETECTOR (DISCRIMINATOR) ALIGNMENT

1. Unsolder and disconnect P201 (front end output cable) from J301 (I.F. input jack).
2. Connect 10.7 MHz crystal oscillator to J301.
3. Connect a V.T.V.M. (D.C.), set to 0.5 volt scale and adjusted to zero (0) at center scale, to the center pin of the "DETECTOR OUTPUT" jack and the chassis.
4. Turn on crystal oscillator and adjust the "secondary" (C712) for zero volts on the V.T.V.M. (Note: You may have to "over adjust" in one direction or the other to compensate for alignment tool capacity.)
5. Disconnect crystal oscillator and reconnect P201 and **SOLDER**.
6. Connect F.M. generator to "ANTENNA" terminals.
7. Connect distortion analyzer to either channel "AUDIO OUTPUT" jack.
8. Set F.M. generator to monaural and adjust for 100% modulation at 400 Hz 1 K  $\mu$ V output.
9. Set Model 20 controls as follows: "DISPLAY" - any position; "MUTING" - either position; "MODE" - STEREO; "POWER" - ON.
10. Tune Model 20 to generator frequency and "fine tune" it to indicate "0" volts on D.C. V.T.V.M.
11. Set distortion analyzer up to read distortion and null.
12. Adjust "primary" (C706) for minimum distortion.
13. Check distortion on other "AUDIO OUTPUT" jack and retouch "primary" to give the best compromise for lowest distortion on both channels. It must be less than 0.15%. If not, see "TROUBLE ANALYSIS" section of this manual.

MPX OSC. BOARD ASSEMBLY 311-1052

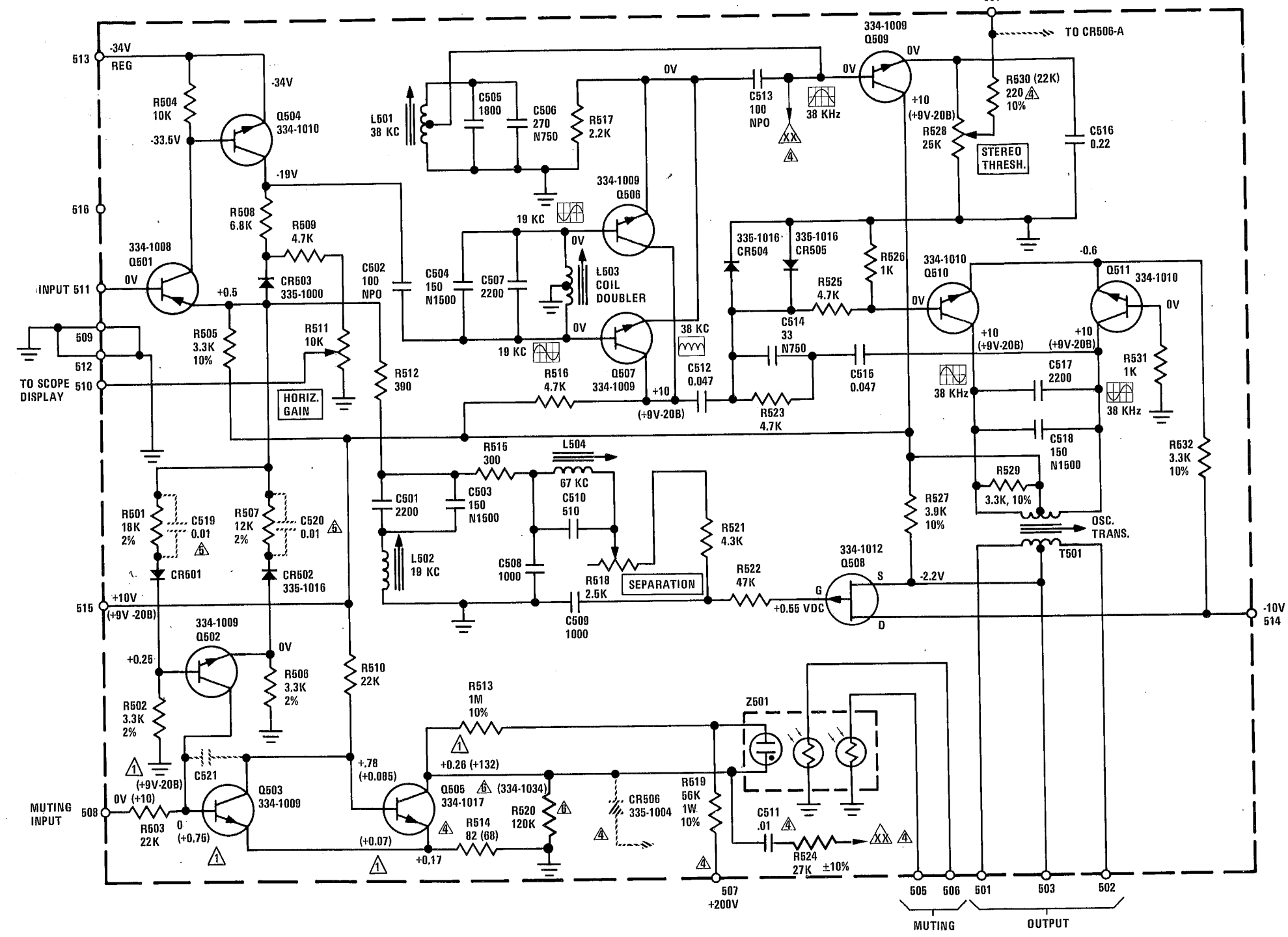


FIGURE 13A - MPX OSCILLATOR SCHEMATIC DIAGRAM

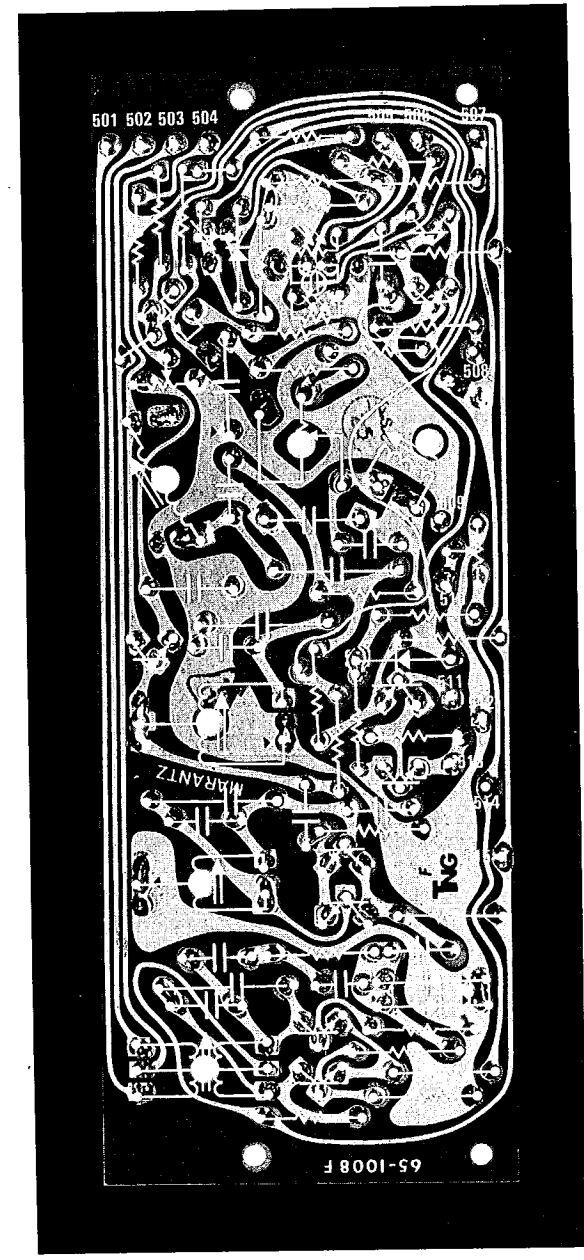


FIGURE 13B - MPX OSCILLATOR CONDUCTOR DIAGRAM

- ⚠ VOLTAGES IN PARENTHESES TAKEN WITH "MUTING OFF" PUSHBUTTON IN.
- 2 ALL VOLTAGES SHOWN TAKEN WITH PIN 511 CONNECTED TO PIN 512 (GROUND).
- 3 WAVEFORMS SHOWN ARE WITH 19 KHz PILOT ONLY - NO MODULATION. - AND ARE FOR APPROXIMATE PHASE RELATIONSHIP ONLY.

- ④ SEE SERVICE NOTE NO. 4
- ⑤ SEE SERVICE NOTE NO. 5
- ⑥ SEE SERVICE NOTE NO. 6

ALL VOLTAGES SHOWN ARE  $\pm 10\%$  (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS  $\frac{1}{2}W$  5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE  $\mu F$ ,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN  $\mu H$

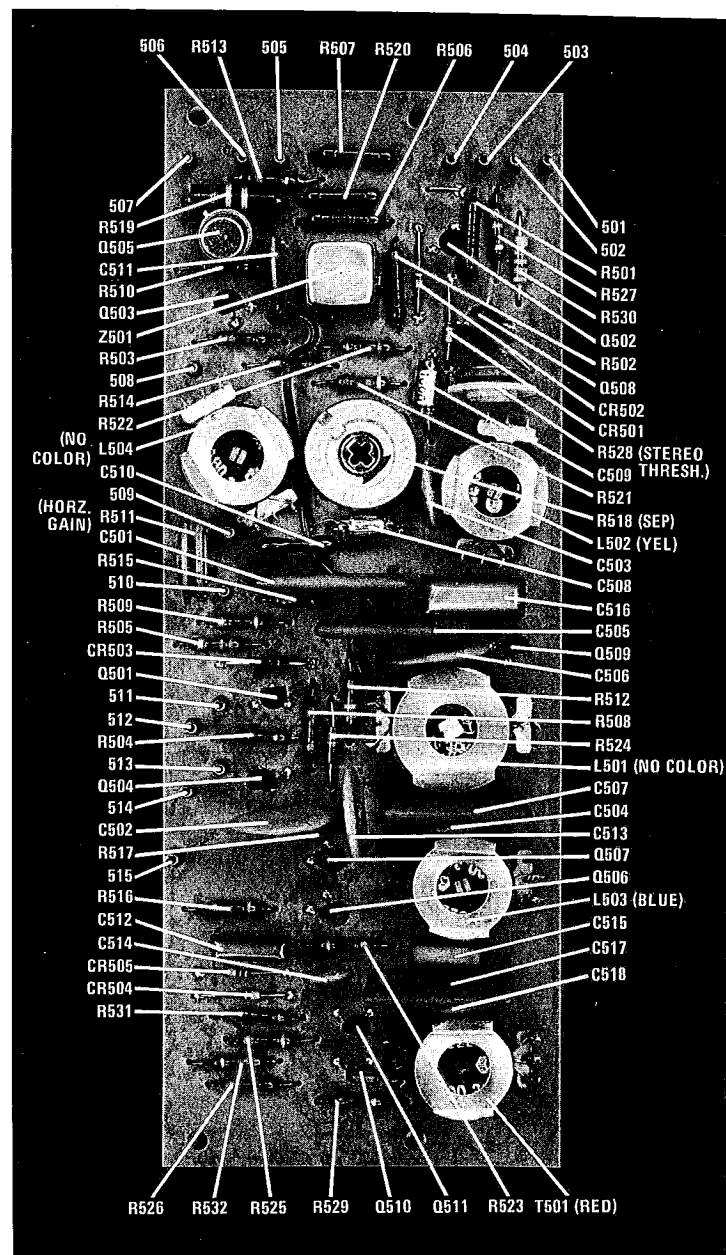


FIGURE 13C - MPX OSCILLATOR COMPONENT DIAGRAM

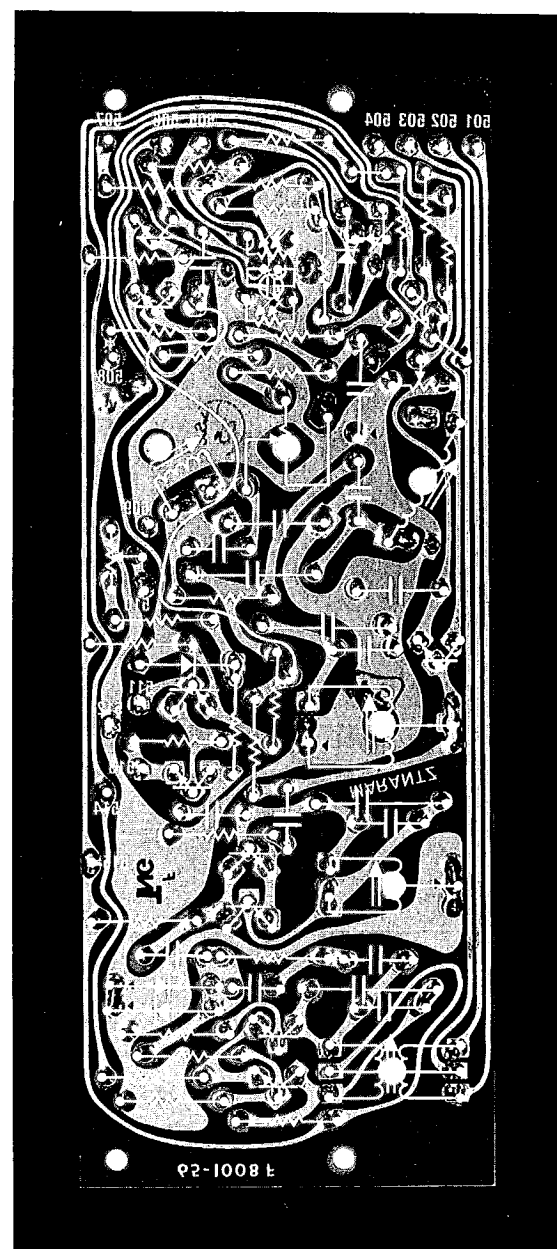


FIGURE 13D - MPX OSCILLATOR CONDUCTOR PATTERN DIAGRAM (AS VIEWED FROM THE COMPONENT SIDE OF BOARD)

MULTIPLEX ALIGNMENT PROCEDURE

Note: Before doing multiplex alignment, check or do the alignment of the detector (discriminator).

1. Connect F.M. stereo generator to "ANTENNA" terminals.
2. Turn on Model 20 and allow it to "warm up" for 10 to 15 minutes.
3. Set Model 20 controls as follows: "DISPLA" - MULTIPATH; "MUTING" - OFF; "MODE" - STEREO; "POWER" - ON.
4. Connect the scope vertical input to output of distortion analyzer.
5. Set distortion analyzer to "SET LEVEL" and increase the "SENSITIVITY" to maximum.
6. Connect a short jumper between the emitter and base of Q510.
7. Connect a standard Tektronics X1 probe to distortion analyzer input and connect as per chart and to ground.
8. Set F.M. stereo generator to 1 K  $\mu$ V output and 98 MHz. Tune Model 20 to generator.
9. Align as indicated in the following chart.

10. Seal all above adjustments EXCEPT L503 and DO NOT disturb during remaining alignment. Remove jumper from Q510 emitter-base.
11. Set F.M. generator to STEREO; pilot level - 10%; and modulate with 15 KHz (90%) either left (A) or right (B) and monitor opposite "AUDIO OUTPUT" jack with distortion analyzer.
12. Adjust T501 and tuning of Model 20 for maximum separation. Note: If a "null" for maximum separation cannot be reached, retouch L503 slightly and adjust T501 again.
13. Adjust R518 and R606 for maximum and equal separation (at 15 KHz) for both R to L and L to R. Retouch T501 if necessary and "retune" Model 20 as required.

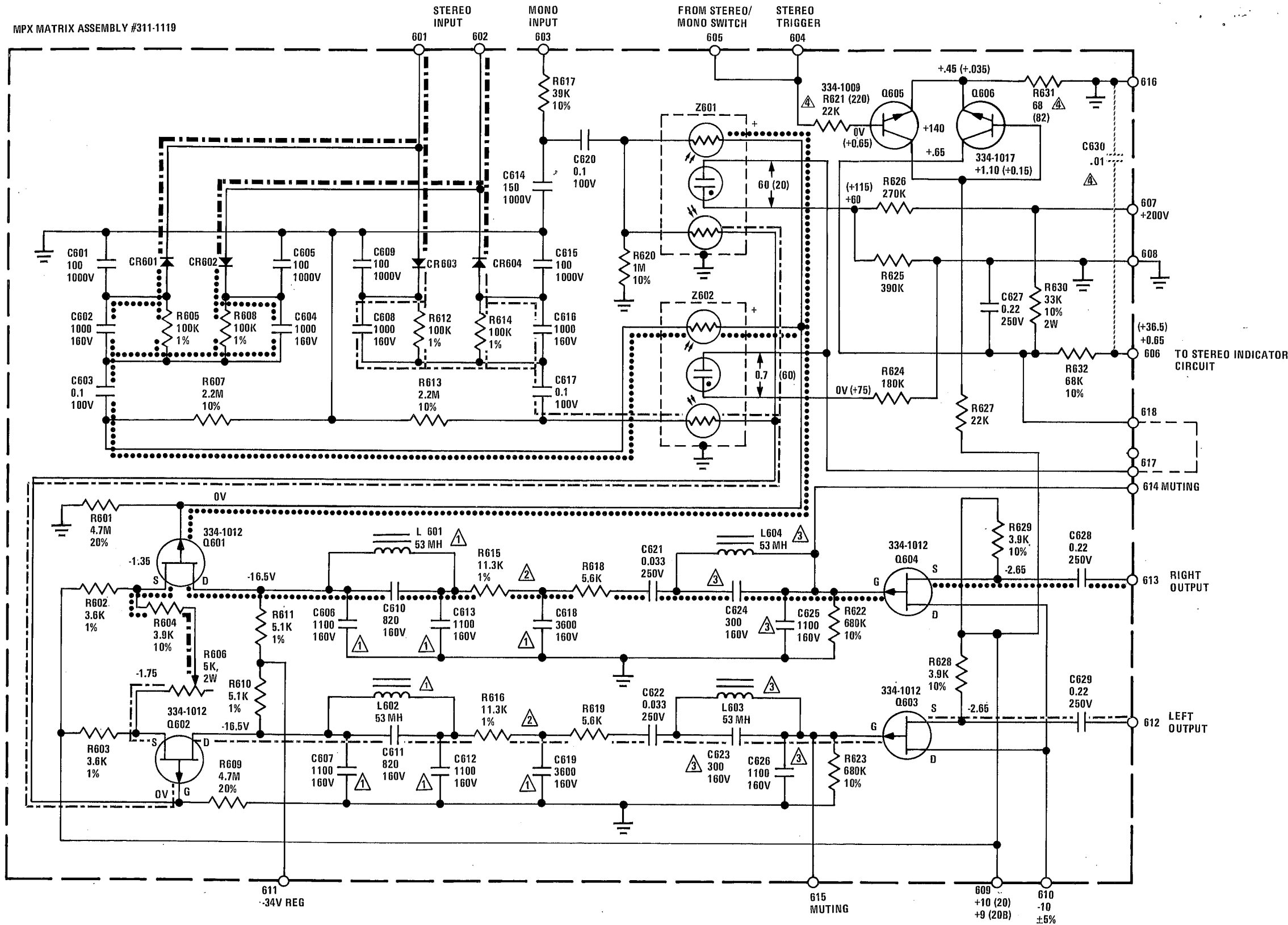
(cont. on page 49)

STEP	FM GENERAL FUNCTION	FM GENERAL FUNCTION	PERCENT OF MODULATION	CONNECT ANALYZER TO	ADJUST	NOTES
A	STEREO	19 KHz PILOT ONLY	10	PIN NO. 503	L502	ADJUST FOR MINIMUM OUTPUT
B	STEREO	19 KHz PILOT ONLY	10	COLLECTOR OF Q506 OR Q507	L503	ADJUST FOR MAXIMUM OUTPUT
C	SCA	1 KHz (INTERNAL)	20	PIN NO. 503	L504	ADJUST FOR MINIMUM OUTPUT
D	STEREO	19 KHz PILOT ONLY	10	*	L501	ADJUST FOR MAXIMUM OUTPUT
E	STEREO	19 KHz PILOT ONLY	6	---	R528	ADJUST CW UNTIL STEREO LIGHT COMES ON

\*WRAP 1 TURN OF INSULATED WIRE AROUND L501 AND CONNECT ANALYZER BETWEEN IT AND GROUND. NOTE: MAKE SURE PROBE IS NOT LYING NEXT TO COILS, OTHERWISE A FALSE READING WILL BE OBTAINED.



MPX MATRIX ASSEMBLY #311-1119



ALL VOLTAGES SHOWN ARE ±10% (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEG-OHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM: LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS ¼W 5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE µF,  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN µH

- ⚠ L601, L602, C606, C607, C610, C611, C612 AND C613 COMPRISE 19 KHz TO 24 KHz FILTER.
- ⚠ R615 AND R616 WITH C618 AND C619 PROVIDE THE MAJOR PORTION OF 75 µS DEMPHEIS. TO CHANGE TO 50 µS (EUROPEAN), CHANGE R615 AND R616 TO 5.3K OR PARALLEL EXISTING 11.3K ±1% RESISTORS WITH 1 EACH 10K ±1% RESISTOR.
- ⚠ L604, L603, C623, C624, C625 AND C626 COMPRISE 38 KHz FILTER.
- RIGHT CHANNEL AUDIO
- LEFT CHANNEL AUDIO
- ▬▬▬ COMPOSITE WAVEFORM (PRIMARY SIGNAL)
- ⚠ SEE SERVICE NOTE NO. 4

VOLTAGES IN PARENTHESES IN STEREO MODE. ALL OTHER VOLTAGES TAKEN WITH PIN 511 ON OSCILLATOR BOARD GROUNDED TO PIN 512.

FIGURE 14A - MPX MATRIX SCHEMATIC DIAGRAM

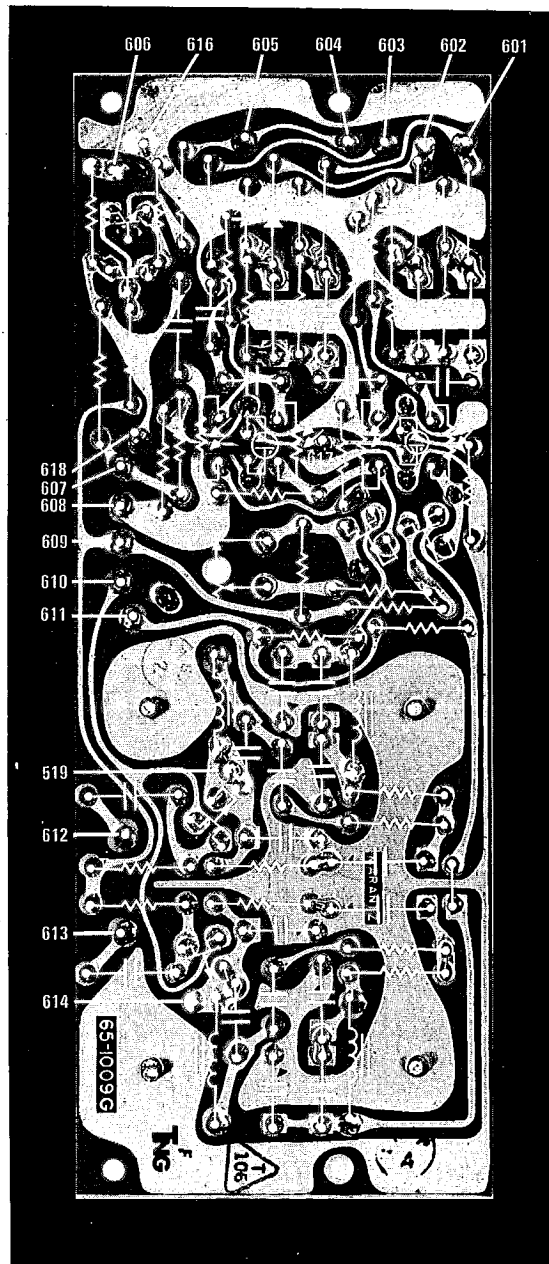


FIGURE 14B - MPX MATRIX CONDUCTOR DIAGRAM

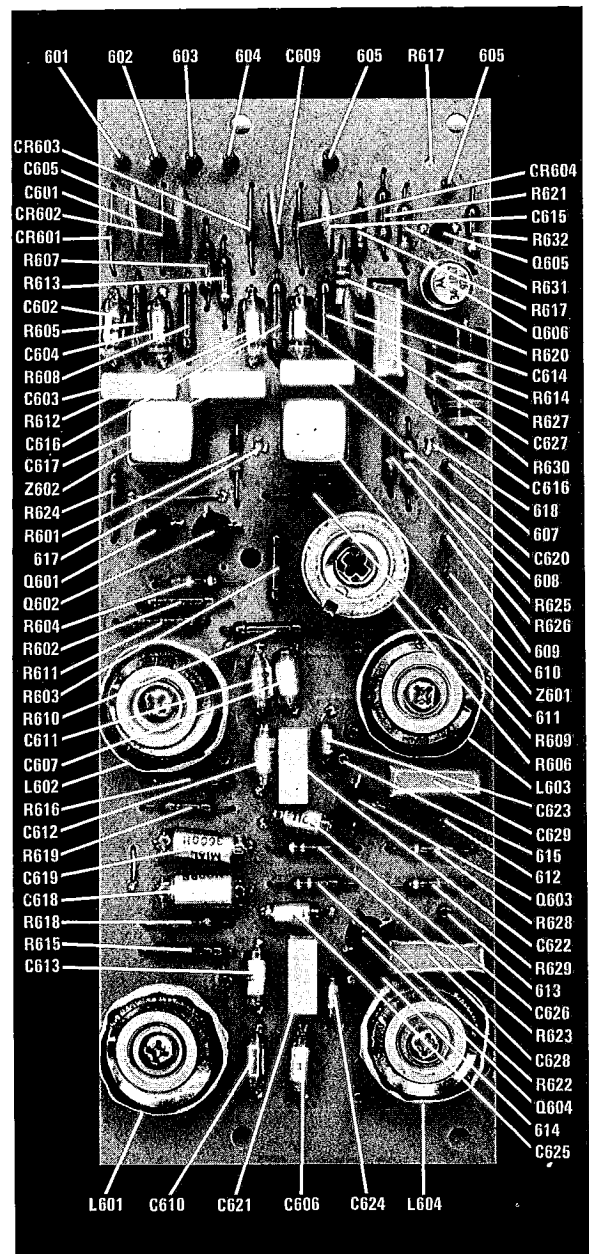


FIGURE 14C - MPX MATRIX COMPONENT DIAGRAM

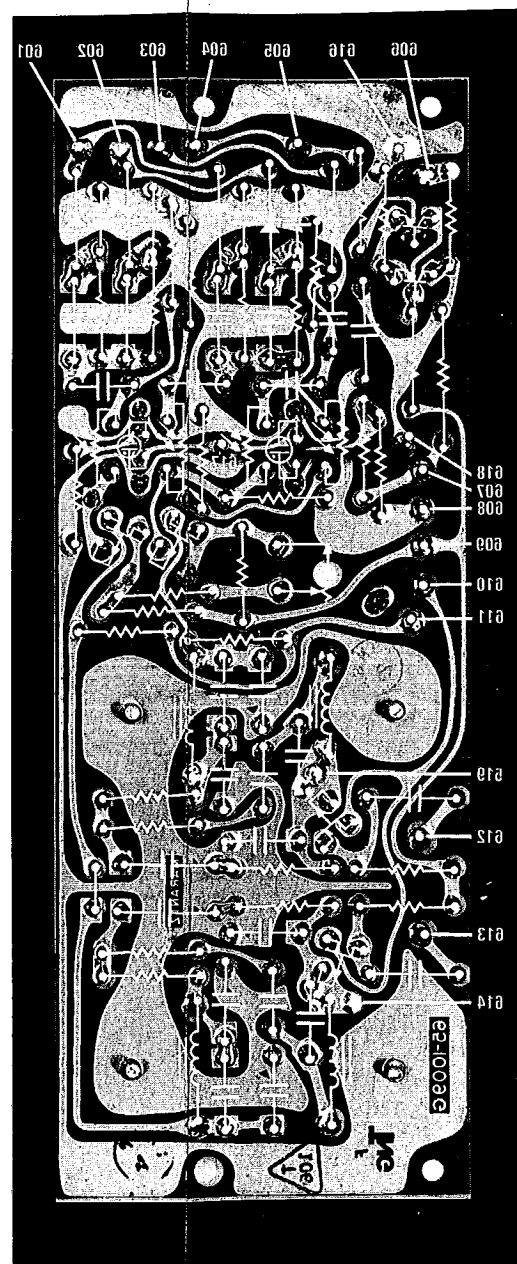
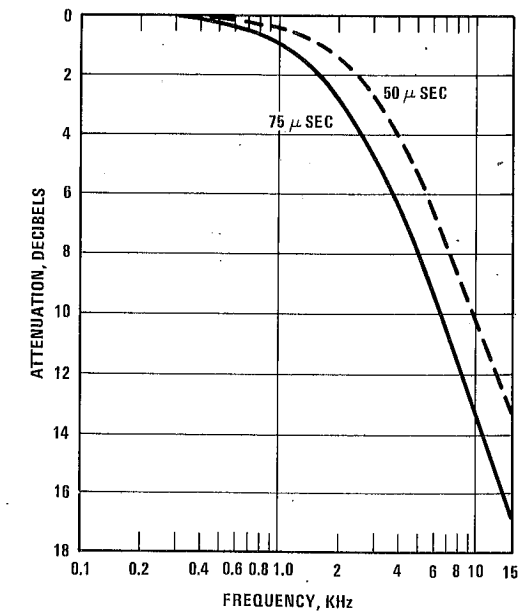
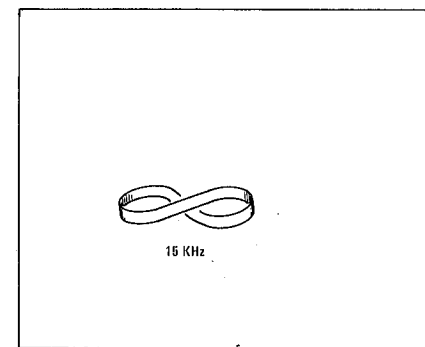
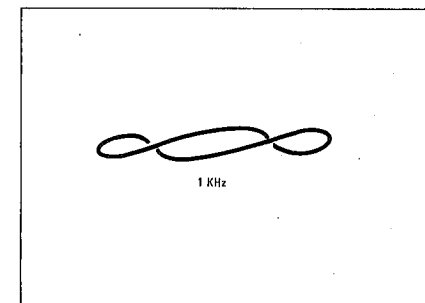


FIGURE 14D - MPX MATRIX CONDUCTOR PATTERN DIAGRAM (AS VIEWED FROM THE COMPONENT SIDE OF BOARD)



f (Hz)	ATTENUATION (dB)	
	75 μ S	50 μ S
20-200	0	0
400	.15	0
1K	.86	.41
2K	2.73	1.43
3K	4.74	2.74
4K	6.48	4.05
5K	8.13	5.38
10K	13.59	10.31
15K	17.02	13.59

FIGURE 14E - ATTENUATION CURVE

14. Change modulation to 1 KHz and readjust R518 and R606 for maximum and equal separation.
15. Recheck separation at 15 KHz for a minimum of 30 dB separation. Retouch T501 if necessary, then recheck separation at 1 KHz for 45 dB minimum separation.
16. With audio generator connected to horizontal input of scope and distortion analyzer output connected to scope vertical input; patterns should appear approximately as shown when properly aligned.
17. Set F.M. generator to monaural, modulation - 1 KHz, 100%.
18. Adjust output of F.M. generator until the horizontal line is centered vertically on the scope.
19. Adjust R511 (HORIZ. GAIN) until the horizontal line just touches the two vertical lines at each side of the scope reticule. If necessary, readjust then "tuning" of the Model 20 to center the line horizontally.

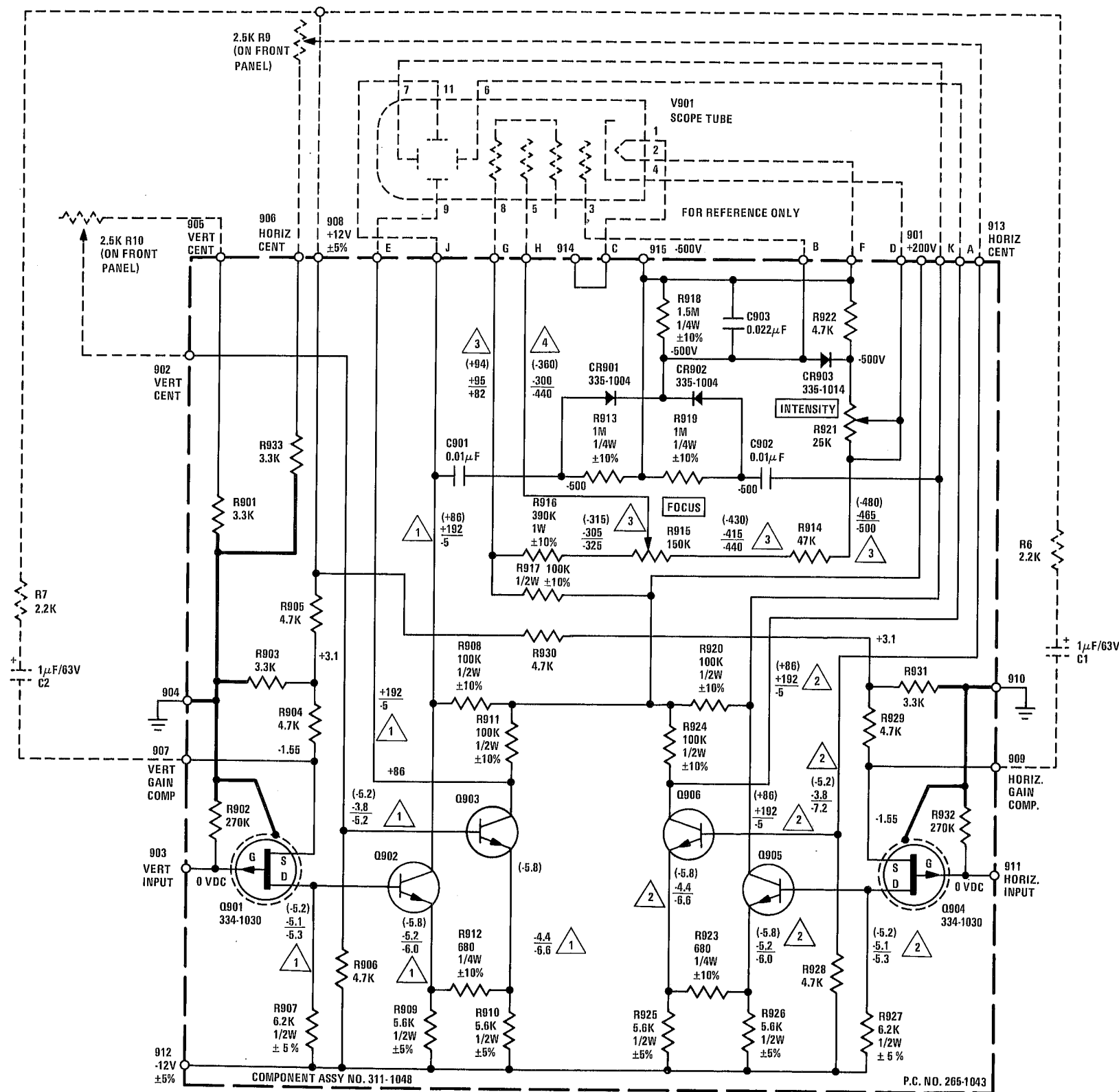


FIGURE 15A - SCOPE SCHEMATIC DIAGRAM

- ① +192/-5 READINGS INDICATE THE TOTAL VOLTAGE RANGES ENCOUNTERED WITH THE VERTICAL POSITION POT SET AT ITS TWO EXTREMES.
- ② +192/-5 READINGS INDICATE THE TOTAL VOLTAGE RANGES ENCOUNTERED WITH THE HORIZONTAL POSITION POT SET AT ITS TWO EXTREMES.

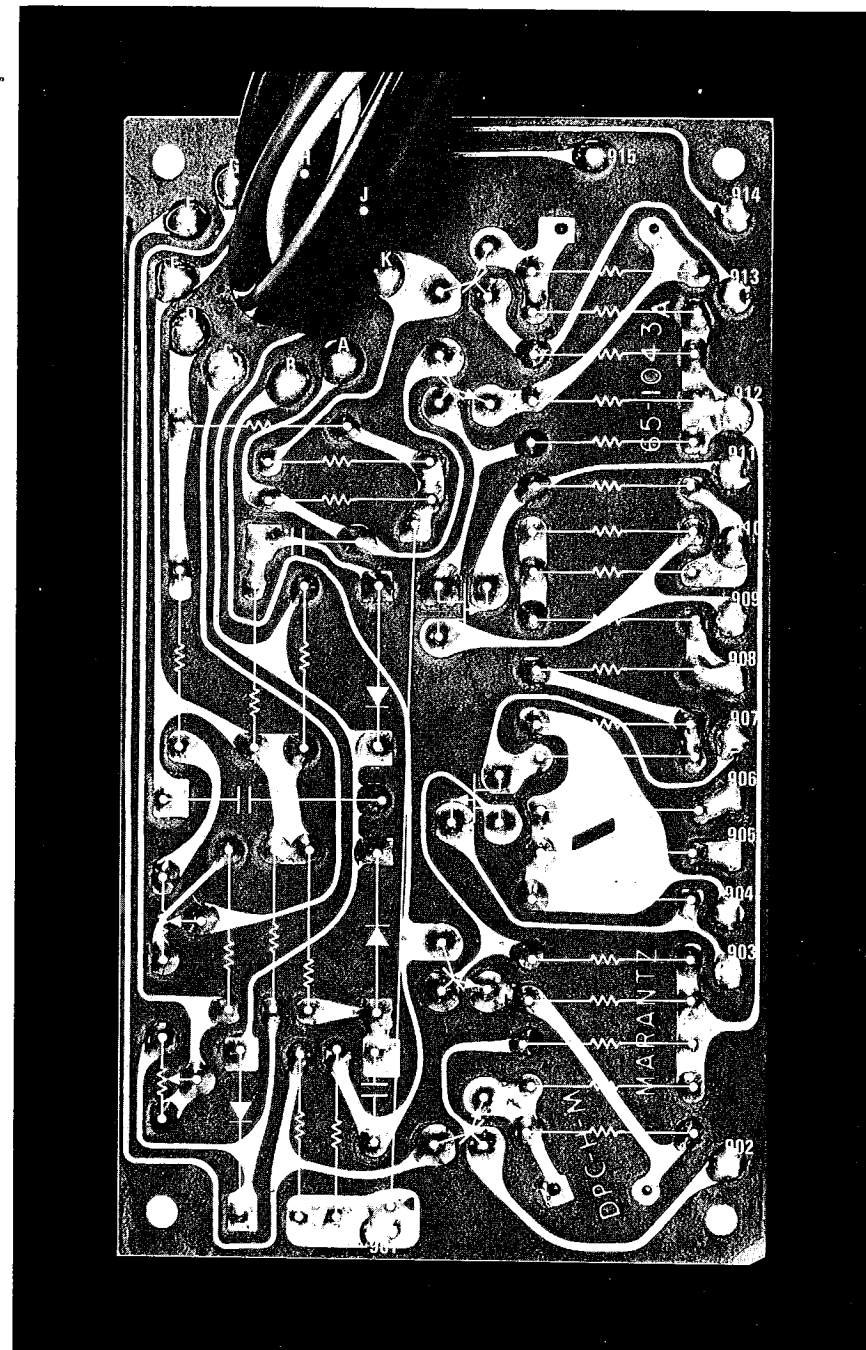


FIGURE 15B - SCOPE CONDUCTOR DIAGRAM

- ③ -415/-440 READINGS INDICATE THE TOTAL VOLTAGE RANGES ENCOUNTERED WITH THE INTENSITY CONTROL POT SET AT ITS TWO EXTREMES.
- ④ -300/440 READINGS INDICATE THE TOTAL VOLTAGE RANGE ENCOUNTERED WITH BOTH THE INTENSITY AND FOCUS POTS SET TO EITHER OF THEIR TWO EXTREMES.
- 5 VOLTAGES SHOWN IN PARENTHESES (+80) ARE APPROXIMATE FOR NORMAL OPERATION WITH SMALL DOT ○ ONLY DISPLAYED AT CENTER OF CRT.

ALL VOLTAGES SHOWN ARE ±10% (UNLESS OTHERWISE NOTED) TAKEN WITH A DC VTVM HAVING AN INPUT IMPEDANCE OF 200 MEGOHMS AND AN AC VTVM HAVING AN INPUT IMPEDANCE OF 1 MEGOHM; LINE VOLTAGE EQUALS 120 VAC AT 60 Hz.

UNLESS OTHERWISE NOTED:  
 ALL RESISTORS ARE IN OHMS ¼W 5%  
 ALL CAPACITORS IN DECIMALS AND LESS THAN 1 ARE µF.  
 ALL OTHER CAPACITORS ARE pF  
 \*ALL INDUCTORS ARE IN µH

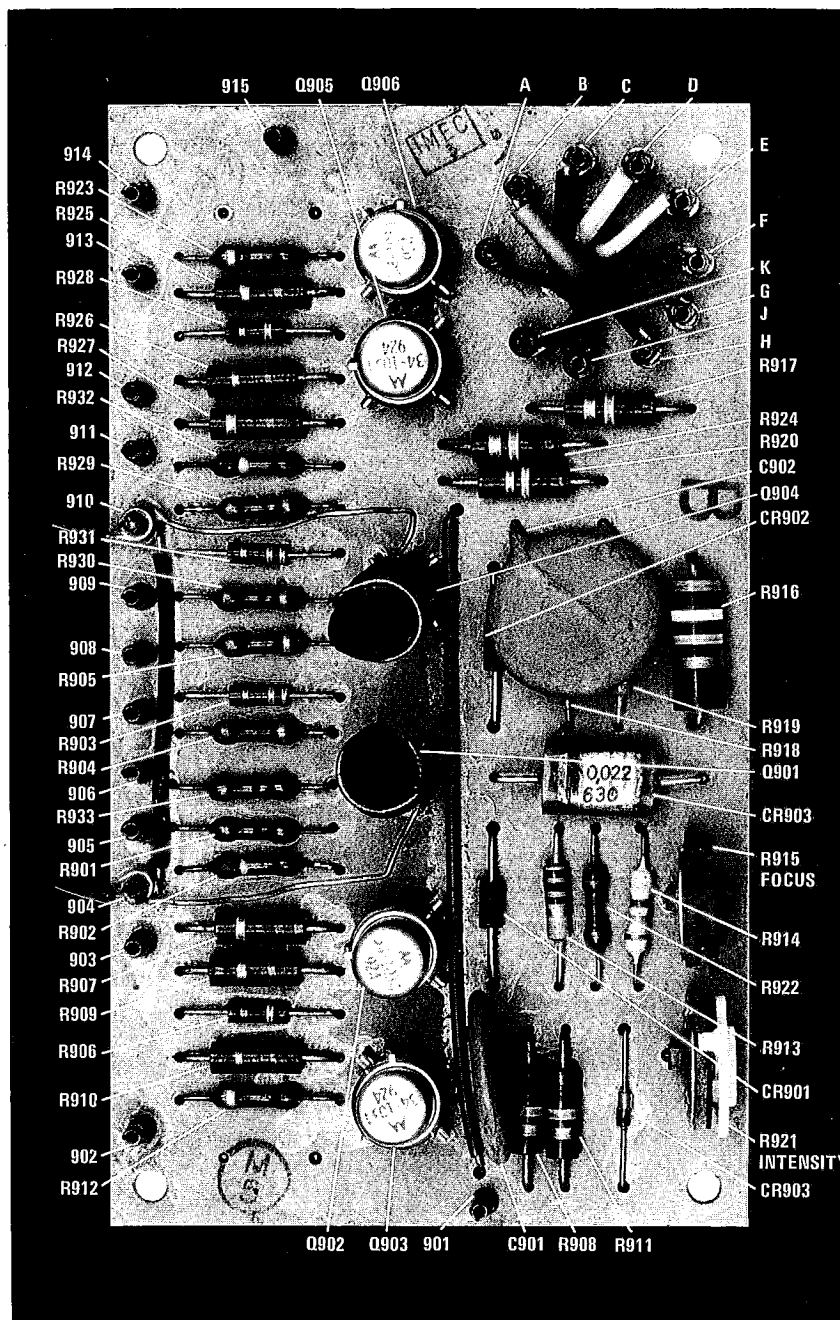


FIGURE 15C - SCOPE COMPONENT DIAGRAM

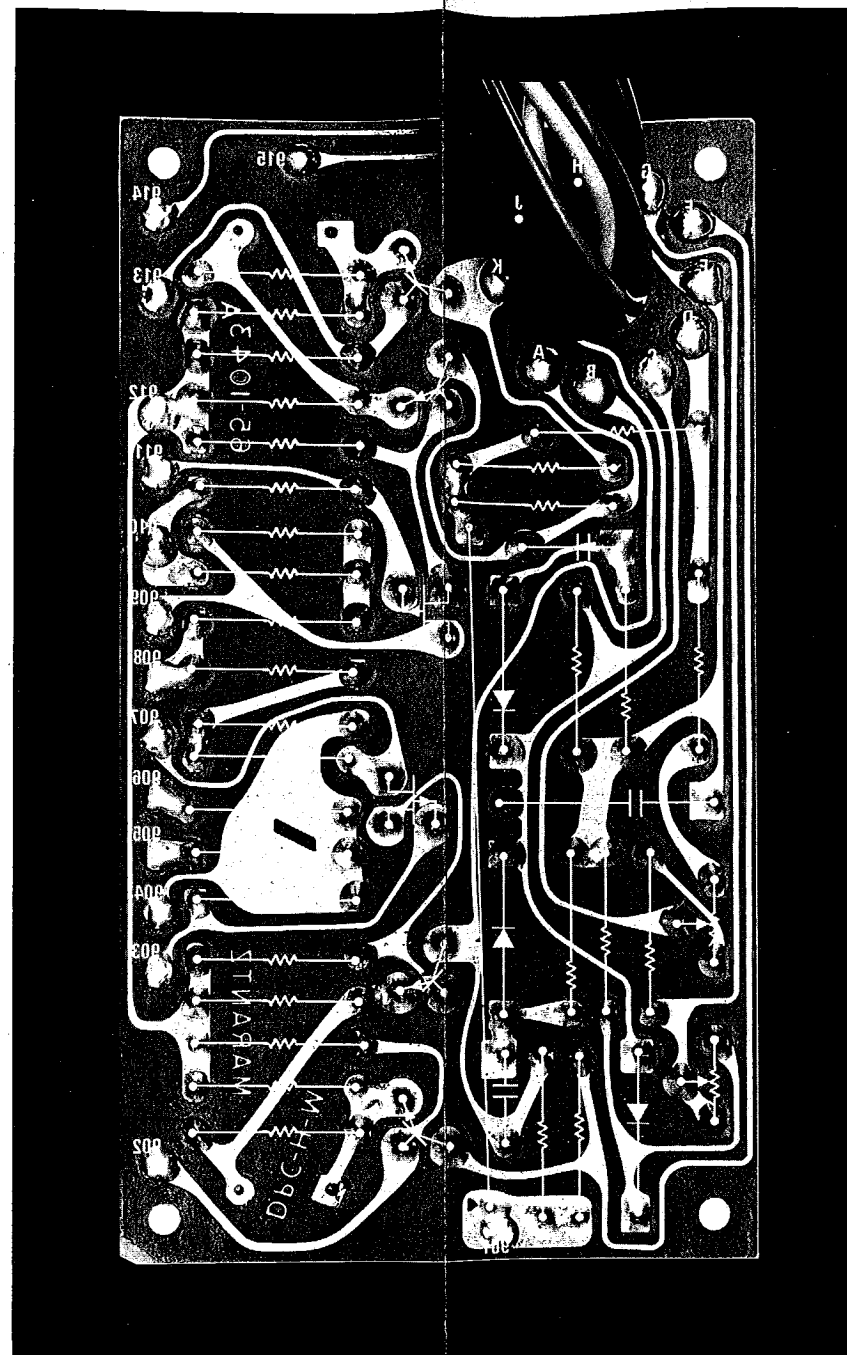


FIGURE 15D - SCOPE CONDUCTOR PATTERN DIAGRAM  
(AS VIEWED FROM THE COMPONENT SIDE OF THE BOARD)

### SCOPE BOARD ADJUSTMENTS

**CAUTION:** HIGH VOLTAGES on the SCOPE BOARD can EQUAL or EXCEED 700 VOLTS. EXTREME CARE should be used when working here.

1. Turn on Model 20 receiver and allow to "warm up" for approximately 5 to 10 minutes.
2. Connection of inputs or outputs are unnecessary.
3. Set the "DISPLAY" Switch to EXTERNAL.
4. Set the "INTENSITY" pot (white) fully C.W. (as viewed from plastic disc side of pot).
5. Set the "FOCUS" pot (red) fully C.C.W. (as viewed from plastic disc side of pot). Caution: Use an INSULATED SCREWDRIVER for ALL ADJUSTMENTS since both pots are "LIVE" with HIGH VOLTAGE.
6. Center the "spot" on the screen of the C.R.T. with the VERT. and HORZ. centering controls on the front panel. (The "spot" will be bright, large and "fuzzy" making it easy to locate.)
7. Turn the "FOCUS" pot (red) C.W. until trace becomes a small sharp dot.
8. Turn the intensity pot (white) C.C.W. until dot is just barely visible.
9. Change the "DISPLAY" Switch to tuning and "tune in" A stations (connect small antenna) and recheck focus and readjust if necessary. The vertical bar should be clearly visible. If not, increase intensity slightly.

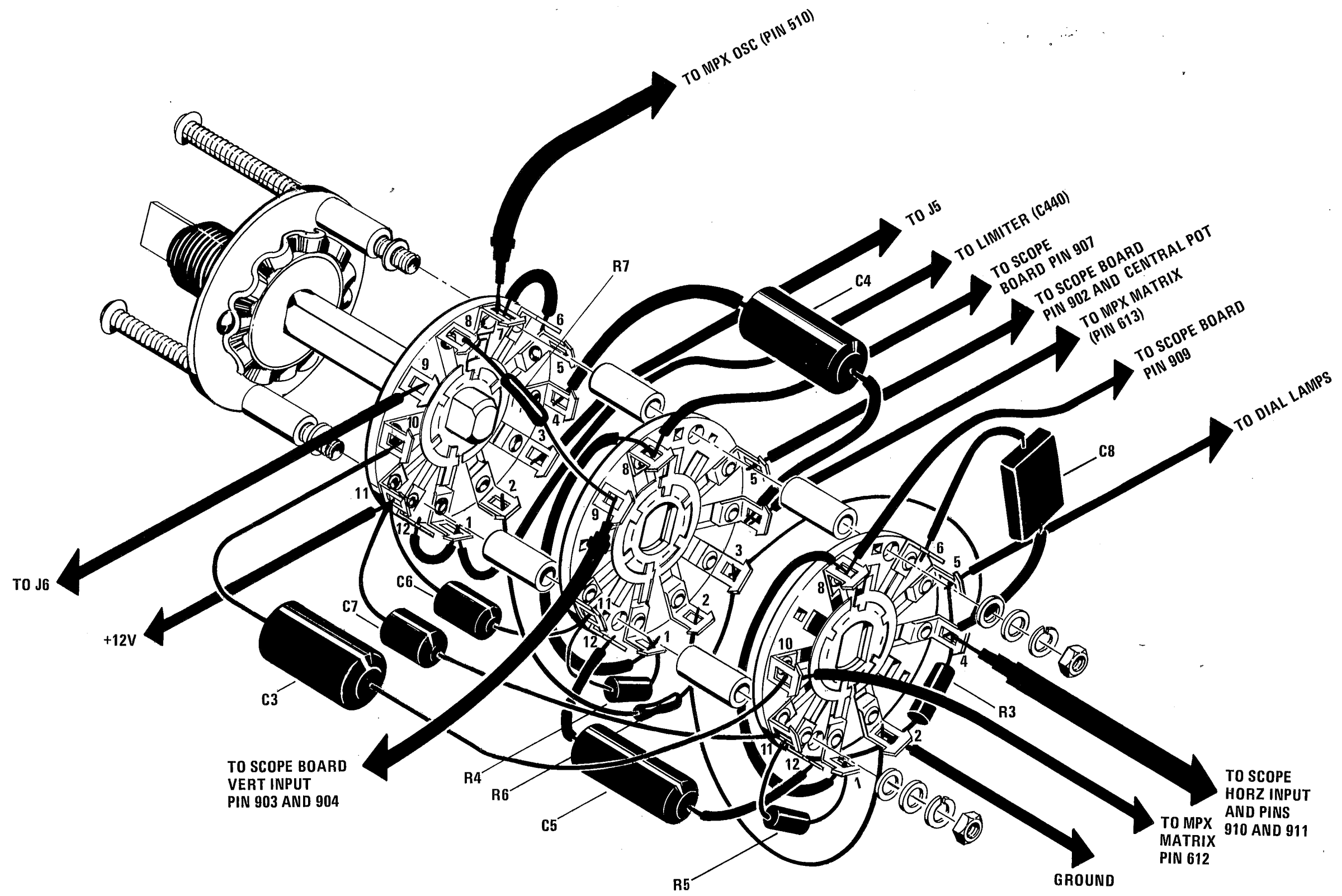


FIGURE 16 - DISPLAY SWITCH WIRING DIAGRAM



## SCOPE BOARD ADJUSTMENTS

CAUTION: HIGH VOLTAGES on the SCOPE BOARD can EQUAL or EXCEED 700 VOLTS. EXTREME CARE should be used when working here.

1. Turn on Model 20 receiver and allow to "warm up" for approximately 5 to 10 minutes.
2. Connection of inputs or outputs are unnecessary.
3. Set the "DISPLAY" Switch to EXTERNAL.
4. Set the "INTENSITY" pot (white) fully C.W. (as viewed from plastic disc side of pot).
5. Set the "FOCUS" pot (red) fully C.C.W. (as viewed from plastic disc side of pot). Caution: Use an INSULATED SCREWDRIVER for ALL ADJUSTMENTS since both pots are "LIVE" with HIGH VOLTAGE.
6. Center the "spot" on the screen of the C.R.T. with the VERT. and HORZ. centering controls on the front panel. (The "spot" will be bright, large and "fuzzy" making it easy to locate.)
7. Turn the "FOCUS" pot (red) C.W. until trace becomes a small sharp dot.
8. Turn the intensity pot (white) C.C.W. until dot is just barely visible.
9. Change the "DISPLAY" Switch to tuning and "tune in" A stations (connect small antenna) and recheck focus and readjust if necessary. The vertical bar should be clearly visible. If not, increase intensity slightly.

PATTERN DIAGRAM  
(IT SIDE OF THE BOARD)

## PARTS LIST

Reference Designation	Description and/or Remarks	Marantz Part Number
A1	Power Supply Board Complete	311-1041-1
C101	Cap., Elect., 20 MFD, 20 MFD at 250 VDC	318-1010
C102	Cap., Elect., 250 MFD, 250 MFD at 80 VDC and 350 MFD at 50 VDC	318-1013
C103	Cap. Elect., 350 MFD at 50 VDC & 350 MFD at 15 VDC	318-1011
C104	Cap. Elect., 350 MFD at 50 VDC & 350 MFD at 15 VDC	318-1012
C105	Cap. Elect., 10 MFD at 350 VDC	318-1017
C106	Cap. Elect., 10 MFD at 350 VDC	318-1017
CR101	Rect. Silicon, H.V., 1500 PIV	335-1015
CR102	Rect. Silicon, 600 PIV, 1A	335-1003
CR103	Rect. Silicon, 600 PIV, 1A	335-1003
CR104	Rect. Silicon, 200 PIV, 1A	335-1004
CR105	Rect. Silicon, 200 PIV, 1A	335-1004
CR106	Diode, 200 PIV, 3A	335-1042
CR107	Diode, 200 PIV, 3A	335-1043
CR108	Diode, 200 PIV, 3A	335-1043
CR109	Diode, 200 PIV, 3A	335-1042
CR110	Zener, Rect., 36V, $\pm 5\%$ , 3W	335-1013
CR111	Zener, Rect., 12V, $\pm 5\%$ , 3W	335-1012
CR112	Zener, Rect., 12V, $\pm 5\%$ , 3W	335-1012
R101	Res., 430 ohm, $\pm 5\%$ , 2W	326-1015
R102	Res., 2.2K, $\pm 10\%$ , 1W	326-1000
R103	Res., 430 ohm, $\pm 5\%$ , 2W	326-1015
R104	Res., 80 ohm, $\pm 5\%$ , 5W	329-1010
R105	Res., 80 ohm, $\pm 5\%$ , 5W	329-1010
R106	Res., 80 ohm, $\pm 5\%$ , 5W	329-1010
R107	Res., 80 ohm, $\pm 5\%$ , 5W	329-1010
	P.C. Board Only	265-1037
	Spacer (P.C. Bd. to Cover)	279-1032

Reference Designation	Description and/or Remarks	Marantz Part Number
	Spacers (P.C. Bd. to Chassis)	279-1034
	Cover Plate	295-1180
	Insulator - Fish Paper	290-1104

Reference Designation	Description and/or Remarks	Marantz Part Number
A2-20	Front End Assembly - Complete (20)	311-1046-1
C200	Cap., 6.8 PFD, $\pm 5\%$ , N220	314-1066
C201	Cap., 10 PFD, $\pm 5\%$ , NPO	314-1017
C202	Cap., Trimmer, 1-12 PFD, NO75	321-1014
C203	Cap., Variable	324-1002
C204	Cap., Trimmer, 1-12 PFD, NO75	321-1014
C205	Cap., Trimmer, 1-12 PFD, NO75	321-1014
C206	Cap., Mica, 15 PFD, $\pm 2\%$	317-1034
C207	Cap., Mica, 15 PFD, $\pm 2\%$	317-1034
C208	Cap., Feedthru, 1000 PFD, $\pm 20\%$	322-1000
C209	Cap., .005 MFD, $\pm 80\%$ , 100V, $-20\%$	314-1014
C210	Cap., Standoff, 1000 PFD	322-1004
C211	Cap., Standoff, 1000 PFD	322-1004
C212	Cap., Standoff, 1000 PFD	322-1004
C213	Cap., 15 PFD, $\pm 5\%$ , NPO	314-1033
C214	Cap., Mica, 5.6 PFD, $\pm 5\%$	317-1003
C215	Cap., 6.8 PFD, $\pm 5\%$ , N220	314-1066
C216	Cap., Variable, 1.7 -11 PFD	321-1015
C217	Cap., Mica, 56 PFD, $\pm 2\%$	317-1031
C218	Cap., Mica, 56 PFD, $\pm 2\%$	317-1031
C219	Cap., 1.5 PFD, $\pm 5\%$	314-1020
C220	Cap., 1.5 PFD, $\pm 5\%$	314-1020
C221	Cap., Mica, 33 PFD, $\pm 5\%$	317-1000
C222	Cap., Mica, 33 PFD, $\pm 5\%$	317-1000
C223	Cap., Mica, 155 PFD, $\pm 2\%$	317-1005



Reference Designation	Description and/or Remarks	Marantz Part Number
CR201	Diode, Hot Carrier	335-1039
CR202	Diode, Hot Carrier	335-1039
CR203	Diode, Hot Carrier	335-1039
CR204	Diode, Hot Carrier	335-1039
J200	Phono Jack	269-1004
L200	Coil, Antenna	255-1050
L201	Coil, Mixer	255-1051
L202	Coil, Oscillator	255-1052
L203	Choke, 55 $\mu$ H	255-1009
L204	Choke, 3.9 $\mu$ H, $\pm$ 10%	255-1023
L205	Choke, 0.27 $\mu$ H	255-1017
L206	Choke, 0.27 $\mu$ H	255-1017
L207	Choke, 1.0 $\mu$ H	255-1018
L208	Choke, 1.0 $\mu$ H	255-1018
L209	Choke, 5.6 $\mu$ H, $\pm$ 5%	255-1053
Q201	Transistor, PNP	334-1037
R201	Resistor, 33 ohms, $\pm$ 10%, 1/4 W	326-1189
R202	Res., 8.2K, $\pm$ 10%, 1/4 W	326-1168
R203	Res., 8.2K, $\pm$ 10%, 1/4 W	326-1168
R204	Res., 470 ohms, $\pm$ 10%, 1/4 W	326-1031
R205	Res., 120 ohms, $\pm$ 10%, 1/4 W	326-1170
T201	Transformer, Mixer Output	255-1016
	Mixer Board Assembly - Complete	311-1072-1
	P.C. Board Only	265-1042
	Output Cable Assembly	292-1030
	Insulator, Mixer Board (Fishpaper .020)	290-1091

Reference Designation	Description and/or Remarks	Marantz Part Number
A2-20B	Front End Assembly - Complete (20B)	311-1073-0
C201	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C202	Cap., .01 MFD, $\pm$ 20%, 100V	314-1068
C203	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C204	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C205	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C206	Cap., 1000 PFD, Stand off	322-1004
C207	Cap., 1000 PFD, Stand off	322-1004
C208	Cap., 1000 PFD, Stand off	322-1004
C209	Cap., 6.8 PFD, $\pm$ 5%, N220	314-1066
C210	Cap., Trimmer, 1-12 PFD NO75	321-1014
C211	Cap., Variable	324-1002
C212	Cap., 6.8 PFD, $\pm$ 5%, N220	314-1066
C213	Cap., Trimmer, 1-12 PFD NO75	321-1014
C214	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C215	Cap., 15 PFD, $\pm$ 5%, NPO	314-1033
C216	Cap., 5.6 PFD, $\pm$ 5%, 500V	317-1003
C217	Cap., 10 PFD, $\pm$ 5%, N220	314-1070
C218	Cap., Variable, 1.7 - 11 PFD	321-1015
C219	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C220	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C221	Cap., 6.8 PFD, $\pm$ 5%, N220	314-1066
C222	Cap., Trimmer, 1-12 PFD NO75	321-1014
J201	Phono Jack	269-1004
L201	Coil, Antenna	255-1057

Reference Designation	Description and/or Remarks	Marantz Part Number
L202	Choke, 55 $\mu$ H	255-1009
L203	Choke, 3.9 $\mu$ H	255-1023
L204	Choke, 55 $\mu$ H	255-1009
L205, L206	Coil Assy., Mixer and R.F.	311-1091
L207	Coil, Oscillator	255-1052
Q201 $\Delta$	Transistor, Dual Gate MOSFET	463-1002
Q202	Transistor, PNP	334-1037
Q203	Transistor, FET	334-1040
R201	Res., 47K, $\pm$ 10%, 1/4W	326-1176
R202	Res., 10 MEG, 10%, 1/4 W	326-1194
R203	Res., 33 ohm, $\pm$ 10%, 1/4W	326-1189
R204	Res., 8.2K, $\pm$ 10%, 1/4W	326-1168
R205	Res., 8.2K, $\pm$ 10%, 1/4W	326-1168
R206	Res., 470 ohm, $\pm$ 10%, 1/4W	326-1031
R207	Res., 220 ohm, $\pm$ 10%, 1/4W	326-1162
R208	Res., 120 ohm, $\pm$ 10%, 1/4W	326-1170
R209	Res., 4.7K, $\pm$ 5%, 1/4W	326-1032
R210	Res., 470 ohm, $\pm$ 5%, 1/4W	326-1031
T201	Transformer, Mixer Output	255-1016
	Output Cable Assy.	292-1038

$\Delta$  463-1002 IS THE RECOMMENDED FIELD REPLACEMENT PART NUMBER. THE ORIGINAL PART NUMBER IS 334-1038.

Reference Designation	Description and/or Remarks	Marantz Part Number
A3-20	I.F. Assembly - Complete (20)	311-1050-0
C301	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C302	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C303	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C304	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C305	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C306	Cap., 1000 PFD, $\pm$ 10%	314-1021
C307	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C308	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C309	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C310	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C311	Cap., 330 PFD, $\pm$ 2%, Mica	317-1022
C312	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C313	Cap., 330 PFD, $\pm$ 2%, Mica	317-1022
C314	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C315	Cap., 330 PFD, $\pm$ 2%, Mica	317-1022
C316	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C317	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C318	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000
C319	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C320	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C321	Cap., .005 MFD, $\pm$ 20%, 100V	314-1014
C322	Cap., 100 PFD, $\pm$ 10%	314-1021
C323	Cap., 1000 PFD, $\pm$ 20%, Feed-Thru	322-1000

Reference Designation	Description and/or Remarks	Marantz Part Number
C324	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C325	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C326	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C327	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C328	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C329	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C330	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C331	Cap., 1000 PFD, $\pm 20\%$ , Feed-Thru	322-1000
C332	Cap., 100 PFD, $\pm 10\%$	314-1021
C333	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C334	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C335	Cap., 1000 PFD, $\pm 20\%$ , Feed-Thru	322-1000
C336	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C337	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C338	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C339	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C340	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C341	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C342	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C343	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C344	Cap., .005 MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C345	Cap., 100 PFD, $\pm 10\%$	314-1021
C346	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C347	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001
C348	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
C349	Cap., 1.2-10 PFD, NO75, Trimmer	321-1001

Reference Designation	Description and/or Remarks	Marantz Part Number
C350	Cap., 330 PFD, $\pm 2\%$ , Mica	317-1022
J301	Phono Jack	269-1004
J302	Phono Jack	269-1004
L301	Choke, 55 $\mu$ H	255-1009
L302	Choke, 55 $\mu$ H	255-1009
L303	Choke, 55 $\mu$ H	255-1009
L304	Choke, 55 $\mu$ H	255-1009
L305	Choke, 55 $\mu$ H	255-1009
L306	Choke, 55 $\mu$ H	255-1009
L307	Choke, 55 $\mu$ H	255-1009
L308	Coil, Adjustable	255-1055
L309	Coil, Adjustable	255-1055
L310	Coil, Adjustable	255-1055
L311	Choke, 55 $\mu$ H	255-1009
L312	Choke, 55 $\mu$ H	255-1005
L313	Choke, 55 $\mu$ H	255-1005
L314	Choke, 55 $\mu$ H	255-1005
L315	Choke, 55 $\mu$ H	255-1005
L316	Choke, 55 $\mu$ H	255-1005
L317	Coil, Adjustable	255-1055
L318	Coil, Adjustable	255-1055
L319	Coil, Adjustable	255-1055
L320	Choke, 55 $\mu$ H	255-1005
L321	Choke, 55 $\mu$ H	255-1005
L322	Choke, 55 $\mu$ H	255-1005
L323	Choke, 55 $\mu$ H	255-1005
L324	Choke, 55 $\mu$ H	255-1005
L325	Coil, Adjustable	255-1055
L326	Coil, Adjustable	255-1055
L327	Coil, Adjustable	255-1055
L328	Choke, 55 $\mu$ H	255-1005
L329	Choke, 55 $\mu$ H	255-1005
L330	Coil, Adjustable	255-1055
L331	Coil, Adjustable	255-1055
L332	Coil, Adjustable	255-1055
Q301	Transistor, NPN (Blue Dot)	334-1018-3
Q302	Transistor, NPN (Red Dot)	334-1018-1
Q303	Transistor, NPN (Yellow Dot)	334-1018-2

Reference Designation	Description and/or Remarks	Marantz Part Number
Q304	Transistor, NPN (Yellow Dot)	334-1018-2
R301	Res., 3.3K, $\pm 10\%$ , 1/4W	326-1181
R302	Control, Trimmer, 10K (Linearity Adjust - Green)	333-1005
R303	Res., 1.8K, $\pm 5\%$ , 1/4W	326-1025
R304	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
R305	Res., 1.8K, $\pm 5\%$ , 1/4W	326-1025
R306	Res., 5.6K, $\pm 10\%$ , 1/4W	326-1182
R307	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
R308	Res., 1.8K, $\pm 5\%$ , 1/4W	326-1025
R309	Res., 220 ohms, $\pm 5\%$ , 1/4W	326-1035
R310	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
R311	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
R312	Res., 1.8K, $\pm 5\%$ , 1/4W	326-1025
R313	Res., 220 ohms, $\pm 5\%$ , 1/4W	326-1035
R314	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
R315	Res., 2.7K, $\pm 5\%$ , 1/4W	326-1026
	P.C. Board Only	265-1045
	Shield, Top	295-1040
	Shield, Bottom	295-1041
	Shield, Circuit	295-1043
	Cover	295-1174

Reference Designation	Description and/or Remarks	Marantz Part Number
A3-20B	I.F. Assembly - Complete (20B)	311-1083-0
C301	Cap. 1000 PFD $\pm 20\%$ , Feed-Thru	322-1000
C302	Cap. 1000 PFD $\pm 20\%$ , Feed-Thru	322-1000
C303	Cap., .005 MFD $+80\%$ , $-20\%$ , 100V	314-1014
C304	Cap., .005 MFD $+80\%$ , $-20\%$ , 100V	314-1014

Reference Designation	Description and/or Remarks	Marantz Part Number
C305	Cap., .005 MFD $+80\%$ , $-20\%$ , 100V	314-1014
C306	Cap., .005 MFD $+80\%$ , $-20\%$ , 100V	314-1014
C307	Cap., .005 MFD $+80\%$ , $-20\%$ , 100V	314-1014
C308	Cap., 100 PFD $\pm 10\%$ , 1000V	314-1021
C309	Cap., 1000 PFD $\pm 20\%$ , Feed-Thru	322-1000
C310	Cap., 1.2 PFD - 10 PFD, Trimmer; NO75	321-1001
C311	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C312	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
C313	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C314	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C315	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C316	Cap. .005MFD $+80\%$ , $-20\%$ , 100V	314-1014
C317	Cap. .005MFD $+80\%$ , $-20\%$ , 100V	314-1014
C318	Cap. .005MFD $+80\%$ , $-20\%$ , 100V	314-1014
C319	Cap. .005MFD $+80\%$ , $-20\%$ , 100V	314-1014
C320	Cap. 100PFD $\pm 10\%$ , 1000V	314-1021
C321	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
C322	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C323	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C324	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
C325	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C326	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C327	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C328	Cap. .005MFD $+80\%$ , $-20\%$ , 100V	314-1014

Reference Designation	Description and/or Remarks	Marantz Part Number
C329	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C330	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C331	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C332	Cap. 100PFD $\pm 10\%$ , 1000V	314-1021
C333	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
C334	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C335	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C336	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
C337	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C338	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C339	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C340	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C341	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C342	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C343	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C344	Cap. 100PFD $\pm 10\%$ , 1000V	314-1021
C345	Cap. 100PFD $\pm 10\%$ , 1000V	314-1021
C346	Cap. .005MFD $\pm 80\%$ , 100V	314-1014
C347	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C348	Cap. 1.2PFD-10PFD Trimmer; NO75	321-1001
C349	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C350	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C351	Cap. 330PFD $\pm 2\%$ , 500V	317-1022
C352	Cap. 100PFD $\pm 10\%$ , 1000V	314-1021

Reference Designation	Description and/or Remarks	Marantz Part Number
C353	Cap. .01MFD $\pm 20\%$ , 100V	314-1068
C354	Cap. 1000PFD $\pm 20\%$ , Feed-Thru	322-1000
CR301	Diode	335-1022
CR302	Diode	335-1022
J301	Phono Jack	269-1004
J302	Phono Jack	269-1004
L301	Choke, 55 $\mu$ H	255-1009
L302	Choke, 55 $\mu$ H	255-1009
L303	Choke, 55 $\mu$ H	255-1009
L304	Choke, 55 $\mu$ H	255-1009
L305	Choke, 55 $\mu$ H	255-1009
L306	Choke, 55 $\mu$ H	255-1009
L307	Coil, Adjustable	255-1055
L308	Coil, Adjustable	255-1055
L309	Coil, Adjustable	255-1055
L310	Choke, 55 $\mu$ H	255-1009
L311	Choke, 55 $\mu$ H	255-1009
L312	Choke, 55 $\mu$ H	255-1009
L313	Choke, 55 $\mu$ H	255-1009
L314	Choke, 55 $\mu$ H	255-1009
L315	Coil, Adjustable	255-1055
L316	Coil, Adjustable	255-1055
L317	Coil, Adjustable	255-1055
L318	Choke, 55 $\mu$ H	255-1009
L319	Choke, 55 $\mu$ H	255-1009
L320	Choke, 55 $\mu$ H	255-1009
L321	Choke, 55 $\mu$ H	255-1009
L322	Choke, 55 $\mu$ H	255-1009
L323	Coil, Adjustable	255-1055
L324	Coil, Adjustable	255-1055
L325	Coil, Adjustable	255-1055
L326	Choke, 55 $\mu$ H	255-1009
L327	Choke, 55 $\mu$ H	255-1009
L328	Choke, 55 $\mu$ H	255-1009
L329	Coil, Adjustable	255-1055
L330	Coil, Adjustable	255-1055
L331	Coil, Adjustable	255-1055




Reference Designation	Description and/or Remarks	Marantz Part Number
L332	Choke, 3.9 $\mu$ H $\pm 10\%$	255-1023
Q301	Transistor, FET	334-1040
Q302	Transistor, NPN	334-1018
Q303	Transistor, NPN	334-1018
Q304	Transistor, NPN	334-1018
R301	Res. 470K, $\pm 10\%$ , 1/4W	326-1193
R302	Res. 1.8K $\pm 5\%$ , 1/4W	326-1025
R303	Res. 3.3K, $\pm 5\%$ , 1/4W	326-1027
R304	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R305	Res. 1.8K, $\pm 5\%$ , 1/4W	326-1025
R306	Res. 33ohm, $\pm 10\%$ , 1/4W	326-1189
R307	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R308	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R309	Res. 1.8K, $\pm 5\%$ , 1/4W	326-1025
R310	Res. 33ohm, $\pm 10\%$ , 1/4W	326-1189
R311	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R312	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R313	Res. 1.8K, $\pm 5\%$ , 1/4W	326-1025
R314	Res. 33ohm, $\pm 10\%$ , 1/4W	326-1189
R315	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R316	Res. 5.6K, $\pm 5\%$ , 1/4W	326-1036
R317	Res. 2.7K, $\pm 5\%$ , 1/4W	326-1026
R318	Res. 220K, $\pm 10\%$ , 1/4W	326-1179
R319	Res. 3.3K, $\pm 5\%$ , 1/4W	326-1027
R320	Res. 1 Meg, $\pm 10\%$ , 1/4W	326-1190
	P.C. Board Component Assy - Complete	311-1078-1
	P.C. Board Only	265-1048
	Cover	295-1202
	Shield, Top	295-1040
	Shield, Bottom	295-1041
	Shield, Circuit	295-1043

Reference Designation	Description and/or Remarks	Marantz Part Number
A4	Limitter Assy.-Complete	311-1049-0
C401	Cap., .005MFD, $\pm 80\%$ , 100V	314-1014
C402	Cap., .005MFD, $\pm 80\%$ , 100V	314-1014
C403	Cap., .005MFD, $\pm 80\%$ , 100V	314-1014
C404	Cap. 100PFD, $\pm 10\%$ , 1000V	314-1021
C405	Cap., 470PFD, $\pm 10\%$ , 1000V	314-1013
C406	Cap., 1000PFD, $\pm 20\%$ , Feed-Thru	322-1000
C407	Cap., 100PFD, $\pm 10\%$ , 1000V	314-1021
C408	Cap., 1000PFD, $\pm 20\%$ , Feed-Thru	322-1000
C409	Cap., 47PFD, $\pm 20\%$ , Feed-Thru	322-1001
C410	Cap., .005MFD $\pm 80\%$ , 100V	314-1014
C411	Cap., .005MFD, $\pm 80\%$ , 100V	314-1014
C412	Cap., 1000PFD, $\pm 20\%$ , Feed-Thru	322-1000
C413	Cap., 100PFD, $\pm 10\%$ , 1000V	314-1021
C414	Cap., .005MFD, $\pm 80\%$ , 100V	314-1014
C415	Cap., 470PFD, $\pm 10\%$ , 1000V	314-1013
C416	Cap., 1000PFD, $\pm 20\%$ , Feed-Thru	322-1000
C417	Cap., 100PFD, $\pm 10\%$ , 1000V	314-1021
C418	Cap., 2.2MFD, $\pm 20\%$ , 15V	316-1001
C419	Cap., 2.2MFD, $\pm 20\%$ , 15V	316-1001
C420	Cap., 47PFD, $\pm 20\%$ , Feed-Thru	322-1001

Reference Designation	Description and/or Remarks	Marantz Part Number
C421	Cap., .005MFD, +80% -20%, 100V	314-1014
C422	Cap., .005MFD, +80% -20%, 100V	314-1014
C423	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C424	Cap., 100PFD, ±10%, 1000V	314-1021
C425	Cap., .005MFD, +80% -20%, 100V	314-1014
C426	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C427	Cap., 470PFD, ±10%, 1000V	314-1013
C428	Cap., 100PFD, ±10%, 1000V	314-1021
C429	Cap., 47PFD, ±20%, Feed-Thru	322-1001
C430	Cap., .005MFD, +80% -20%, 100V	314-1014
C431	Cap., .005MFD, +80% -20%, 100V	314-1014
C432	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C433	Cap., .005MFD, +80% -20%, 100V	314-1014
C434	Cap., 470PFD, ±10%, 1000V	314-1013
C435	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C436	Cap., 47PFD, ±20%, Feed-Thru	322-1001
C437	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C438	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C439	Cap., 1000PFD, ±20%, Feed-Thru	322-1000
C440	Cap., 47PFD, ±20%, Feed-Thru	322-1001
CR401	Diode, Signal	335-1017
CR402	Diode, Signal	335-1017

Reference Designation	Description and/or Remarks	Marantz Part Number
CR403	Diode, Hot Carrier	335-1039
CR404	Diode, Hot Carrier	335-1039
CR405	Diode, Signal	335-1017
CR406	Diode, Signal	335-1017
CR407	Diode, Hot Carrier	335-1039
CR408	Diode, Hot Carrier	335-1039
CR409	Diode, Signal	335-1017
CR410	Diode, Signal	335-1017
CR411	Diode, Hot Carrier	335-1039
CR412	Diode, Hot Carrier	335-1039
CR413	Diode, Limiting	335-1033
CR414	Diode, Limiting	335-1033
L401	Choke, 55 μH	255-1009
L402	Choke, 4.7 μH, ±5%	255-1019
L403	Choke, 55 μH	255-1009
L404	Choke, 55 μH	255-1009
L405	Choke, 55 μH	255-1009
L406	Choke, 55 μH	255-1009
L407	Choke, 55 μH	255-1009
L408	Choke, 4.7 μH, ±5%	255-1019
L409	Choke, 55 μH	255-1009
L410	Choke, 55 μH	255-1009
L411	Choke, 55 μH	255-1009
L412	Choke, 55 μH	255-1009
L413	Choke, 55 μH	255-1009
L414	Choke, 55 μH	255-1009
L415	Choke, 4.7 μH, ±5%	255-1019
L416	Choke, 55 μH	255-1009
L417	Choke, 55 μH	255-1009
L418	Choke, 55 μH	255-1009
L419	Choke, 55 μH	255-1009
L420	Choke, 55 μH	255-1009
L421	Choke, 4.7 μH, ±5%	255-1019
L422	Choke, 55 μH	255-1009
L423	Choke, 55 μH	255-1009
Q401	Transistor, NPN	334-1018
Q402	Transistor, NPN	334-1018
Q403	Transistor, NPN	334-1018

Reference Designation	Description and/or Remarks	Marantz Part Number
Q404	Transistor, NPN	334-1018
R401	Res., 2.7K, ±10%, 1/4W	326-1174
R402	Res., 220ohm, ±10%, 1/4W	326-1162
R403	Res., 47K, ±10%, 1/4W	326-1176
R404	Res., 2.7K, ±10%, 1/4W	326-1174
R405	Res., 220ohm, ±10%, 1/4W	326-1162
R406	Res., 47K, ±10%, 1/4W	326-1176
R407	Res., 2.7K, ±10%, 1/4W	326-1174
R408	Res., 220ohm, ±10%, 1/4W	326-1162
R409	Res., 47K, ±10%, 1/4W	326-1176
R410	Res., 47K, ±10%, 1/4W	326-1176
R411	Res., 2.7K, ±10%, 1/4W	326-1174
R412	Res., 100ohm, ±10%, 1/4W	325-1173
R413	Control, Trimmer, 25K (AM Display - White)	333-1006
R414	Control, Trimmer, 10K (D.C. Level - Blue)	333-1051
R415	Res., 47K, ±10%, 1/4W	326-1176
R416	Res., 220K, ±10%, 1/4W	326-1179
R417	Control, Trimmer, 150K (muting - Blue)	333-1052
R418	Res., 220K, ±10%, 1/4W	326-1179
	Input Cable Assembly	292-1029
	Output Cable Assembly	292-1032
	Cover	295-1035
	Shield	295-1042
	P.C. Board Component Assy. Complete	311-1080-1
	P.C. Board Only	265-1002

Reference Designation	Description and/or Remarks	Marantz Part Number
A5	MPX Oscillator Board Component Assy Complete	311-1118-1
C501	Cap., 2200PFD, ±1%, 500V	317-1017
C502	Cap., 100PFD, ±5%, 1000V	314-1006
C503	Cap., 150PFD, ±5%, 1000V	314-1005
C504	Cap., 150PFD, ±5%, 1000V	314-1005
C505	Cap., 1800PFD, ±1%, 500V	317-1018
C506	Cap., 270PFD, ±5%, 1000V	314-1022
C507	Cap., 2200PFD, ±1%, 500V	317-1017
C508	Cap., 1000PFD, ±2½%, 160V	315-1005
C509	Cap., 1000PFD, ±2½%, 160V	315-1005
C510	Cap., 510PFD, ±2½%, 500V	317-1002
C511 	Cap., .01MFD, ±20%, 500V	314-1003
C512	Cap., .047MFD, ±5%, 250V	313-1004
C513	Cap., 100PFD, ±5%, 1000V	314-1006
C514	Cap., 33PFD, ±5%, 1000V	314-1009
C515	Cap., .047MFD, ±5%, 250V	313-1004
C516	Cap., 0.22MFD, ±10%, 250V	313-1001
C517	Cap., 2200PFD, ±1%, 500V	317-1017
C518	Cap., 150PFD, ±5%, 1000V	314-1005
C519 	Cap., .01MFD, ±20%, 500V	314-1003
C520 	Cap., .01MFD, ±20%, 500V	314-1003

Reference Designation	Description and/or Remarks	Marantz Part Number
C521 $\triangle$	Cap., 0.1MFD, $\pm 20\%$ , 12VDC	383-1007
CR501	Diode	335-1016
CR502	Diode	335-1016
CR503	Diode, Ref. (Stabistor)	335-1000
CR504	Diode	335-1016
CR505	Diode	335-1016
CR506 $\triangle$	Diode	335-1004
L501	38KHz Coil	311-1014
L502	19KHz Coil	311-1015
L503	38KHz Doubler Coil	311-1013
L504	67KHz Coil	311-1016
R501	Res., 18K, $\pm 2\%$ , $\frac{1}{4}W$	330-1046
R502	Res., 3.3K, $\pm 2\%$ , $\frac{1}{4}W$	330-1047
R503	Res., 22K, $\pm 5\%$ , $\frac{1}{4}W$	327-1027
R504	Res., 10K, $\pm 5\%$ , $\frac{1}{4}W$	327-1024
R505	Res., 3.3K, $\pm 10\%$ , $\frac{1}{4}W$	327-1006
R506	Res., 3.3K, $\pm 2\%$ , $\frac{1}{4}W$	330-1047
R507	Res., 12K, $\pm 2\%$ , $\frac{1}{4}W$	330-1045
R508	Res., 6.8K, $\pm 5\%$ , $\frac{1}{4}W$	327-1003
R509	Res., 4.7K, $\pm 5\%$ , $\frac{1}{4}W$	327-1049
R510	Res., 22K, $\pm 5\%$ , $\frac{1}{4}W$	327-1027
R511	Potentiometer, 10K (Horz. Gain - Green)	333-1005
R512	Res., 390ohm, $\pm 5\%$ , $\frac{1}{4}W$	327-1052
R513	Res., 1Meg, $\pm 10\%$ , $\frac{1}{4}W$	327-1001
R514 $\triangle$	Res., 82ohm, $\pm 5\%$ , $\frac{1}{4}W$	327-1058
R514 $\triangle$	Res., 68ohm, $\pm 5\%$ , $\frac{1}{4}W$	327-1045
R515	Res., 300ohm, $\pm 5\%$ , $\frac{1}{4}W$	327-1054
R516	Res., 4.7K, $\pm 5\%$ , $\frac{1}{4}W$	327-1049
R517	Res., 2.2K, $\pm 5\%$ , $\frac{1}{4}W$	327-1051
R518	Potentiometer, W/W, 2.5K (Separation)	333-1010
R519	Res., 56K, $\pm 10\%$ , 1W	326-1172
R520 $\triangle$	Res., 120K, $\pm 5\%$ , $\frac{1}{4}W$	327-1061
R521	Res., 4.3K, $\pm 5\%$ , $\frac{1}{4}W$	327-1050
R522	Res., 47K, $\pm 5\%$ , $\frac{1}{4}W$	327-1022
R523	Res., 4.7K, $\pm 5\%$ , $\frac{1}{4}W$	327-1049
R524 $\triangle$	Res., 27K, $\pm 10\%$ , $\frac{1}{4}W$	326-1108

Reference Designation	Description and/or Remarks	Marantz Part Number
R525	Res., 4.7K, $\pm 5\%$ , $\frac{1}{4}W$	327-1049
R526	Res., 1K, $\pm 5\%$ , $\frac{1}{4}W$	327-1036
R527	Res., 3.9K, $\pm 10\%$ , $\frac{1}{4}W$	327-1047
R528	Potentiometer, 25K - (Stereo threshold-White)	333-1006
R529	Res., 3.3K, $\pm 10\%$ , $\frac{1}{4}W$	327-1006
R530 $\triangle$	Res., 220 $\Omega$ , $\pm 10\%$ , $\frac{1}{4}W$	327-1111
R530 $\triangle$	Res., 22K, $\pm 5\%$ , $\frac{1}{4}W$	327-1027
R531	Res., 1K, $\pm 5\%$ , $\frac{1}{4}W$	327-1036
R532	Res., 3.3K, $\pm 10\%$ , $\frac{1}{4}W$	327-1006
Q501	Transistor, PNP	334-1008
Q502	Transistor, NPN	334-1009
Q503	Transistor, NPN	334-1009
Q504	Transistor, NPN	334-1010
Q505 $\triangle$	Transistor, NPN	334-1017
	Transistor, NPN	334-1034
Q506	Transistor, NPN	334-1009
Q507	Transistor, NPN	334-1009
Q508	Transistor, FET P-Channel	334-1012
Q509	Transistor, NPN	334-1009
Q510	Transistor, NPN	334-1010
Q511	Transistor, NPN	334-1010
T-501	38KHz Oscillator Transformer	311-1012
	P.C. Board only	265-1008
	Spacers, P.C. Board To Chassis	279-1033
Z501	Photocell Muting Dble Pole	331-1006
	Washer-Nylon (under mtg. screws)	281-1040
	Socket, Transistor	268-1023

$\triangle$  See Service Note No. 4  
 $\triangle$  See Service Note No. 5  
 $\triangle$  See Service Note No. 6

} See Page 2

Reference Designation	Description and/or Remarks	Marantz Part Number
A6	Multiplex Matrix Board Component Assy Complete	311-1119-1
C601	Cap., 100PFD, $\pm 5\%$ , 1000V	314-1007
C602	Cap., 1000PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1005
C603	Cap., 0.1MFD, $\pm 10\%$ , 100V	313-1022
C604	Cap., 1000PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1005
C605	Cap., 100PFD, $\pm 5\%$ , 1000V	314-1007
C606	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C607	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C608	Cap., 1000PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1005
C609	Cap., 100PFD, $\pm 5\%$ , 1000V	314-1007
C610	Cap., 820PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1006
C611	Cap., 820PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1006
C612	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C613	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C614	Cap., 150PFD, $\pm 5\%$ , 1000V	314-1005
C615	Cap., 100PFD, $\pm 5\%$ , 1000V	314-1007
C616	Cap., 1000PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1005
C617	Cap., 0.1MFD, $\pm 10\%$ , 100V	313-1022
C618	Cap., 3600PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1002
C619	Cap., 3600 PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1002
C620	Cap., 0.1MFD, $\pm 10\%$ , 100V	313-1022

Reference Designation	Description and/or Remarks	Marantz Part Number
C621	Cap., 0.033 MFD, $\pm 10\%$ , 250V	313-1005
C622	Cap., 0.033MFD, $\pm 10\%$ , 250V	313-1005
C623	Cap., 300PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1008
C624	Cap., 300PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1008
C625	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C626	Cap., 1100PFD, $\pm 2\frac{1}{2}\%$ , 160V	315-1004
C627	Cap., 0.22MFD, $\pm 10\%$ , 250V	313-1001
C628	Cap., 0.22MFD, $\pm 10\%$ , 250V	313-1001
C629	Cap., 0.22MFD, $\pm 10\%$ , 250V	313-1001
C630 $\triangle$	Cap., 0.03 MFD, $\pm 20\%$ , 100V	383-1002
CR601	Diode, Silicon, Signal	335-1016
CR602	Diode, Silicon, Signal	335-1016
CR603	Diode, Silicon, Signal	335-1016
CR604	Diode, Silicon, Signal	335-1016
L601	LPF Coil Sub Assembly -53mH $\pm 1mH$	311-1017
L602	LPF Coil Sub Assembly -53mH $\pm 1mH$	311-1017
L603	LPF Coil Sub Assembly -53mH $\pm 1mH$	311-1017
L604	LPF Coil Sub Assembly -53mH $\pm 1mH$	311-1017
Q601 $\triangle$	Transistor, FET	334-1012
Q602 $\triangle$	Transistor, FET	334-1012
Q603	Transistor, FET	334-1012
Q604	Transistor, FET	334-1012
Q605	Transistor, NPN	334-1009
Q606	Transistor, NPN	334-1017

Reference Designation	Description and/or Remarks	Marantz Part Number
R601	Res., 4.7Meg, $\pm 20\%$ , 1/4W	326-1010
R602	Res., 3.6K, $\pm 1\%$ , 1/4W	330-1026
R603	Res., 3.6K, $\pm 1\%$ , 1/4W	330-1026
R604	Res., 3.9K, $\pm 10\%$ , 1/4W	327-1047
R605	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
R606	Control, W.W., 5K, 2W (Separation)	333-1009
R607	Res., 2.2Meg., $\pm 10\%$ , 1/4W	327-1048
R608	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
R609	Res., 4.7Meg, $\pm 20\%$ , 1/4W	326-1010
R610	Res., 5.1K, $\pm 1\%$ , 1/4W	330-1025
R611	Res., 5.1K, $\pm 1\%$ , 1/4W	330-1025
R612	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
R613	Res., 2.2Meg, $\pm 10\%$ , 1/4W	327-1048
R614	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
R615 $\triangle$	Res., 11.3K, $\pm 1\%$ , 1/4W	330-1024
R616 $\triangle$	Res., 11.3K, $\pm 1\%$ , 1/4W	330-1024
R617	Res., 39K, $\pm 5\%$ , 1/4W	327-1023
R618	Res., 5.6K, $\pm 5\%$ , 1/4W	327-1044
R619	Res., 5.6K, $\pm 5\%$ , 1/4W	327-1044
R620	Res., 1Meg, $\pm 10\%$ , 1/4W	327-1001
R631 $\triangle$	Res., 22K $\pm 5\%$ , 1/4W	327-1027

Reference Designation	Description and/or Remarks	Marantz Part Number
R621 $\triangle$	Res., 220ohm, $\pm 10\%$ , 1/4W	327-1111
R622	Res., 680K, $\pm 10\%$ , 1/4W	327-1046
R623	Res., 680K, $\pm 10\%$ , 1/4W	327-1046
R624	Res., 180K, $\pm 5\%$ , 1/4W	327-1042
R625	Res., 390K, $\pm 5\%$ , 1/4W	327-1040
R626	Res., 270K, $\pm 5\%$ , 1/4W	327-1041
R627	Res., 22K, $\pm 5\%$ , 1/4W	327-1027
R628	Res., 3.9K, $\pm 10\%$ , 1/4W	327-1047
R629	Res., 3.9K, $\pm 10\%$ , 1/4W	327-1047
R630	Res., 33K, $\pm 10\%$ , 2W	326-1009
R631 $\triangle$	Res., 68ohm, $\pm 5\%$ , 1/4W	327-1045
R621 $\triangle$	Res., 82ohm, $\pm 5\%$ , 1/4W	327-1058
R632	Res., 68K, $\pm 10\%$ , 1/4W	327-1011
Z601	Data Cell (Dual)	331-1005
Z602	Data Cell (Dual)	331-1005
	Spacer - P.C. Board to Chassis	279-1033
	Washer - Nylon (under mtg screws)	281-1040
	P.C. Board only	265-1053
	Socket, Transistor	268-1023

$\triangle$  SEE SERVICE NOTE NO. 4 ON PAGE 2.  
 $\triangle$  R615 AND R616 WILL BE 5.3K (5.23K) P/N 430-4530 IN 220 VOLT UNITS (50 $\mu$  SECOND DE-EMPHASIS)  
 $\triangle$  Q601 AND Q602 HAVE A SELECTED  $Y_{fs}$  (GM) AND  $I_{dss}$  RANGE AND SHOULD BE REPLACED AS A PAIR.

Reference Designation	Description and/or Remarks	Marantz Part Number
A7	Detector Assy Complete	311-1088-1
C701	Cap., 1000PFD, $\pm 20\%$ , Feed-Thru	322-1000
C702	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C703	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C704	Cap., 2.2MFD, $+80\%$ , $-20\%$ , 15V	316-1001
C705	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C706	Cap., 1 - 18PFD Trimmer, Air, P.C. Mt.	321-1000
C707	Cap., 70PFD, $\pm 1\%$ , 500V	317-1004
C708	Cap., 5.6PFD, $\pm 5\%$ , 500V	317-1003
C709	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C710	Cap., 155PFD, $\pm 2\%$ , 500V	317-1005
C711	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C712	Cap., 1 - 18PFD Trimmer, Air P.C. Mt.	321-1000
C713	Cap., 2.2MFD, $\pm 20\%$ , 15V	316-1001
C714	Cap., 22PFD, $\pm 10\%$ , 1000V	314-1015
C715	Cap., .005MFD, $+80\%$ , $-20\%$ , 100V	314-1014
C716	Cap., 1.000PFD, $\pm 20\%$ , Feed-thru	322-1000
CR701	Diode	335-1017
CR702	Diode	335-1017
J701	Phono Jack	269-1004
L701	Choke, 55 $\mu$ H	255-1009
L702	Choke, 55 $\mu$ H	255-1009
L703	Coil, Discriminator	255-1001

Reference Designation	Description and/or Remarks	Marantz Part Number
L704	Choke, 55 $\mu$ H	255-1009
L705	Choke, 55 $\mu$ H	255-1009
L706	Choke, 55 $\mu$ H	255-1009
Q701	Transistor, NPN	334-1032
R701	Res., 2.2K, $\pm 5\%$ , 1/4W	326-1104
R702	Res., 8.2K, $\pm 5\%$ , 1/4W	326-1028
R703	Res., 560ohm, $\pm 5\%$ , 1/4W	326-1098
R704	Res., 5.6K, $\pm 5\%$ , 1/4W	326-1036
R705	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
R706	Res., 100K, $\pm 1\%$ , 1/4W	330-1023
	P.C. Board Component Assy Complete	311-1044-1
	P.C. Board Only	265-1003
	Transistor Heat Dissipater	562-1000
	Cover	295-1037
	Output Cable Assy	292-1031

Reference Designation	Description and/or Remarks	Marantz Part Number
A8	Line Driver Assy - Complete	311-1058-1
C801	Cap., 1MFD, $\pm 10\%$ , 250V	313-1024
C802	Cap., 1MFD, $\pm 10\%$ , 250V	313-1024
Q801	Transistor, PNP	334-1008
Q802	Transistor, PNP	334-1008
Q803	Transistor, NPN	334-1031
Q804	Transistor, NPN	334-1031
R801	Control, Trimmer 100K (Output Level Adjust-Blue)	333-1050



Reference Designation	Description and/or Remarks	Marantz Part Number
R802	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R803	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R804	Control, Trimmer 100K (Output Level Adjust-Blue)	333-1050
R805	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R806	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R807	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R808	Res., 10K, $\pm 5\%$ , 1/4W	327-1024
R809	Res., 1K, $\pm 5\%$ , 1/4W	327-1036
R810	Res., 1K, $\pm 5\%$ , 1/4W	327-1036
R811	Res., 1K, $\pm 5\%$ , 1/4W	327-1036
R812	Res., 1K, $\pm 5\%$ , 1/4W	327-1036
R813	Res., 470ohms, $\pm 5\%$ , 1/4W	327-1026
R814	Res., 470ohms, $\pm 5\%$ , 1/4W	327-1026
R815	Res., 100K, $\pm 10\%$ , 1/4W	327-1019
R816	Res., 100K, $\pm 10\%$ , 1/4W	327-1019
	P.C. Board Only	265-1044
	Spacer - P.C. Board to Chassis	279-1027
	Washer, Nylon (Under Mounting Nuts)	281-1040

Reference Designation	Description and/or Remarks	Marantz Part Number
A9	Scope Board Component Assy Complete	311-1048-0
C901	Cap., .01MFD, $\pm 80\%$ , $\pm 20\%$ , 1K, V	314-1002
C902	Cap., .01MFD, $\pm 80\%$ , $\pm 20\%$ , 1K, V	314-1002
C903	Cap., .022MFD, $\pm 20\%$ , 600V	313-1025
CR901	Diode, Rect. 200 PIV 1A	335-1004
CR902	Diode, Rect. 200 PIV 1A	335-1004
CR903	Diode, Ref. (Stabistor)	335-1014
Q901	Transistor, FET	334-1030
Q902	Transistor, High Voltage, NPN	334-1034
Q903	Transistor, High Voltage, NPN	334-1034
Q904	Transistor, FET	334-1030
Q905	Transistor, High Voltage, NPN	334-1034
Q906	Transistor, High Voltage, NPN	334-1034
R901	Res., 3.3K, $\pm 5\%$ , 1/4W	327-1025
R902	Res., 270K, $\pm 5\%$ , 1/4W	327-1041
R903	Res., 3.3K, $\pm 5\%$ , 1/4W	327-1025
R904	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R905	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R906	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R907	Res., 6.2K, $\pm 5\%$ , 1/2W	326-1192
R908	Res., 100K, $\pm 10\%$ , 1/2W	326-1013
R909	Res., 5.6K, $\pm 5\%$ , 1/4W	326-1093

Reference Designation	Description and/or Remarks	Marantz Part Number
R910	Res., 5.6K, $\pm 5\%$ , 1/2W	326-1093
R911	Res., 100K, $\pm 10\%$ , 1/2W	326-1013
R912	Res., 680ohm, $\pm 10\%$ , 1/4W	327-1017
R913	Res., 1Meg, $\pm 10\%$ , 1/4W	317-1001
R914	Res., 47K, $\pm 5\%$ , 1/4W	327-1022
R915	Control, Trimmer, 150K (Red-Focus)	333-1008
R916	Res., 390K, $\pm 10\%$ , 1W	326-1012
R917	Res., 100K, $\pm 10\%$ , 1/2W	326-1013
R918	Res., 1.5Meg, $\pm 10\%$ , 1/4W	327-1056
R919	Res., 1Meg, $\pm 10\%$ , 1/4W	327-1001
R920	Res., 100K, $\pm 10\%$ , 1/2W	326-1013
R921	Control, Trimmer, 25K (White - Intensity)	333-1006
R922	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R923	Res., 680ohm, $\pm 10\%$ , 1/4W	327-1017
R924	Res., 100K, $\pm 10\%$ , 1/2W	326-1013
R925	Res., 5.6K, $\pm 5\%$ , 1/2W	326-1093
R926	Res., 5.6K, $\pm 5\%$ , 1/2W	326-1093
R927	Res., 6.2K, $\pm 5\%$ , 1/2W	326-1192
R928	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R929	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R930	Res., 4.7K, $\pm 5\%$ , 1/4W	327-1049
R931	Res., 3.3K, $\pm 5\%$ , 1/4W	327-1025
R932	Res., 270K, $\pm 5\%$ , 1/4W	327-1041
R933	Res., 3.3K, $\pm 5\%$ , 1/4W	327-1025
	Socket, Transistor (Small)	268-1023
	Socket, Transistor (Large)	268-1024
	FET Transistor Shield	271-1024
	FET Transistor Shield Sleeving-3/4" Long	820-9012
	P.C. Board only	265-1043

Reference Designation	Description and/or Remarks	Marantz Part Number
	Terminal cover (Cardboard-Black)	290-1095
	C.R.T. Socket Subassembly	292-1027
	Spacers - P.C. Board to chassis	279-1033
	Insulator - .020 Fish Paper	290-1090
	Washer, Nylon (under screw heads)	281-1040

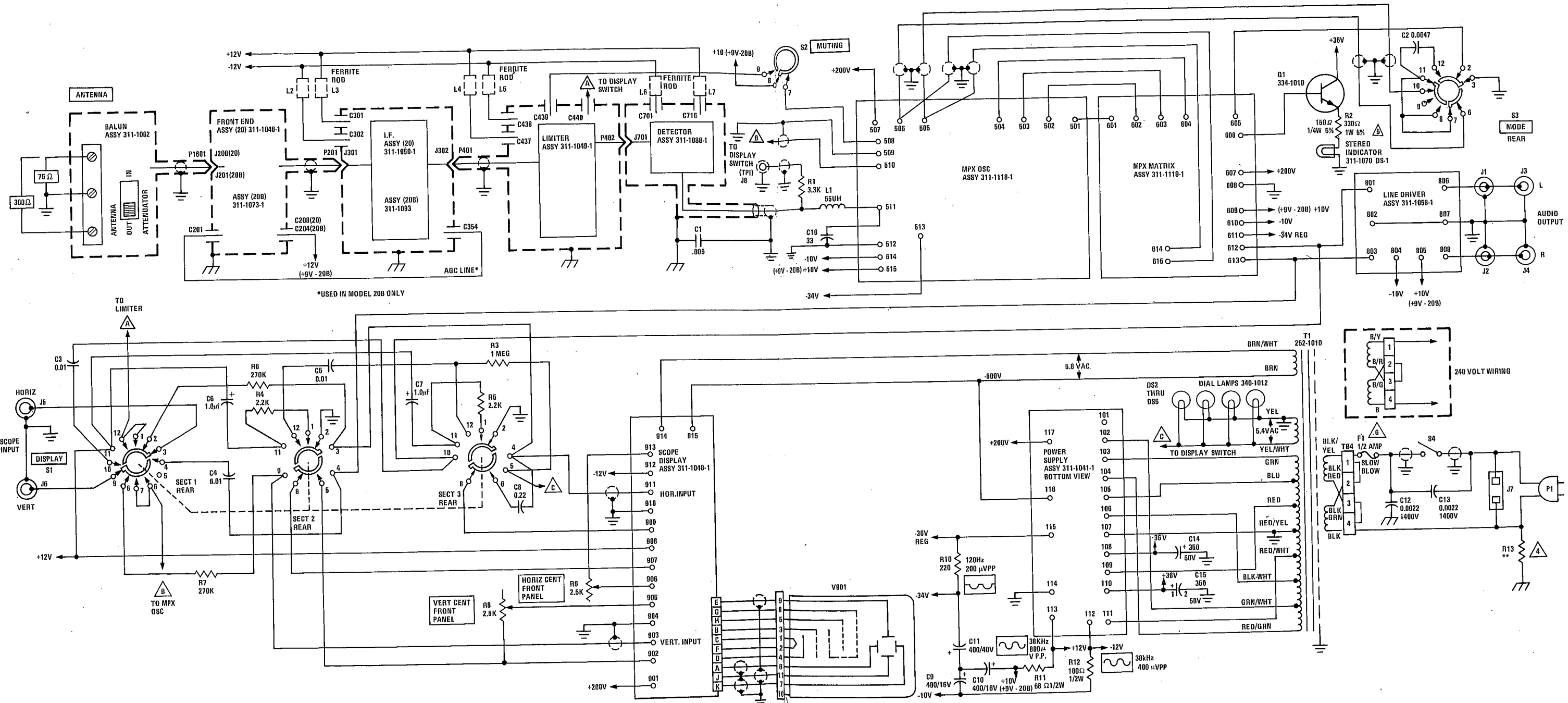
Reference Designation	Description and/or Remarks	Marantz Part Number
A16	Balun Housing Assy - Complete	311-1062-1
R1601	Res., 62ohms, $\pm 5\%$ , 1/4W	326-1187
R1602	Res., 62ohms, $\pm 5\%$ , 1/4W	326-1187
R1603	Res., 15ohms, $\pm 5\%$ , 1/4W	326-1188
SW1601	Switch, Slide, DPDT	452-1003
T1601	Transformer, Balun	255-1020
TB1601	Terminal Block, Antenna Housing	287-1001
	Housing Cover, Snap	295-1177
	Output Cable Assembly	295-1178
	Output Cable Assembly	292-1026
	MAIN CHASSIS PARTS	
C1	Cap., .005MFD, $\pm 80\%$ , $\pm 20\%$ , 100V	314-1014
C2	Cap., .0047MFD, $\pm 20\%$ , (On Mode Switch)	314-1065
C3	Cap., .01MFD, $\pm 5\%$ , 125V (On Display Switch)	315-1013
C4	Cap., .01MFD, $\pm 5\%$ , 125V (On Display Switch)	315-1013

Reference Designation	Description and/or Remarks	Marantz Part Number
C5	Cap., .01MFD, $\pm 5\%$ , 125V (On Display Switch)	315-1013
C6	Cap., 1MFD, 63V, Electrolytic (On Display Switch)	319-1023
C7	Cap., 1MFD, 63V, Electrolytic (On Display Switch)	319-1023
C8	Cap., 0.22MFD, $\pm 10\%$ , 250V (On Display Switch)	313-1007
C9	Cap., 400MFD, 16V, Electrolytic	319-1026
C10	Cap., 400MFD, 16V, Electrolytic	319-1026
C11	Cap., 400MFD, 40V, Electrolytic	319-1029
C12	Cap., .0022MFD, $+80\%$ , $-20\%$ , 1400 VDC	314-1016
C13	Cap., .0022MFD, $+80\%$ , $-20\%$ , 1400 VDC	314-1016
C14	Cap., 350MFD, 50V, Electrolytic	318-1018
C15	Cap., 350MFD, 50V, Electrolytic	318-1018
C16	Cap., 33PFD, $\pm 20\%$ , N750	314-1067
DS-1	Stereo Indicator Lamp Assembly	311-1070-1
	Lamp Only - GE#2187D	340-1011
DS2 thru DS5	Lamp, GE #55	340-1012
F1 $\triangle 1$	Fuse, $\frac{1}{2}$ AMP, Slow-Blo, 125V	341-1010
J1 thru J6	Phono Jack Strip - 6 Jacks	269-1017
J7	Socket, A.C. (Receptacle)	268-1001
J8 (TP1)	Phono Jack	269-1010
L1	Choke, 55 $\mu$ H	255-1009

Reference Designation	Description and/or Remarks	Marantz Part Number
L2 thru L7	Ferrite Bead (Rod)	255-1008
P1	Line Cord (With Plug)	292-1019
Q1	Transistor, NPN	334-1010
R1	Res., 3.3K, $\pm 10\%$ , $\frac{1}{4}$ W	326-1181
R2 $\triangle 3$	Res., 150ohms, $\pm 10\%$ , $\frac{1}{4}$ W	326-1184
R2 $\triangle 3$	Res., 330ohms, $\pm 5\%$ , 1W	326-1186
R3	Res., 1Meg, $\pm 10\%$ , $\frac{1}{4}$ W (On Display Switch)	327-1001
R4	Res., 2.2K, $\pm 10\%$ , $\frac{1}{4}$ W (On Display Switch)	327-1015
R5	Res., 2.2K, $\pm 10\%$ , $\frac{1}{4}$ W (On Display Switch)	327-1015
R6	Res., 270K, $\pm 5\%$ , $\frac{1}{4}$ W (On Display Switch)	327-1041
R7	Res., 270K, $\pm 5\%$ , $\frac{1}{4}$ W (On Display Switch)	327-1041
R8	Control, Centering, 2.5K	333-1045
R9	Control, Centering, 2.5K	333-1045
R10	Res., 220ohms, $\pm 10\%$ , $\frac{1}{2}$ W	327-1116
R11	Res., 68ohms, $\pm 10\%$ , $\frac{1}{2}$ W	327-1114
R12	Res., 100ohms, $\pm 10\%$ , $\frac{1}{2}$ W	327-1115
R13 $\triangle 2$	Res., 3.3Meg, $\pm 20\%$ , $\frac{1}{2}$ W	326-1195
S1	Switch, "Display," 5 Position	346-1017
	Display Switch Assy - Complete	311-1064-1
S2	Switch, "Muting," 2 Position	346-1018
S3	Switch, "Mode," 3 Position	346-1019
S4	Switch, "Power," 2 Position	346-1020
T1	Transformer, Power	252-1010
V901	CRT W/13 Pin Nixie Base	337-1000

Reference Designation	Description and/or Remarks	Marantz Part Number
XDS2 thru XDS5	Lamp Socket	268-1026
XF1	Fuse Holder (Post)	342-1000
	Dial Pulley (On Front End)	263-1004
	Dial Pulley Set Screw	273-1026
	Dial Spring	271-1023
	Dial Pointer	262-1004
	CRT Rubber Band	290-1015
	CRT Clip	290-1014
	Knob 15/16" Dia.	260-1005
	Knob Set Screw	273-1004
	Knob, Control (CRT Centering)	260-1028
	Cover, Top	295-1172
	Cover, Bottom	295-1169
	Foot, Black	290-1018
	Tuning Knob Assy	311-1043-1
	Pivot Screw (For Tuning Knob)	271-1022
	Dial Scale Diffuser	261-1006
	Scope Reticule	260-1076
	Plastic Accordion Rivet (Fastens Stereo Indicator Lamp Assembly)	290-1094
	Dial Window Frame	260-1064
	Tinted Plexiglass	261-1005
	Pushnut Fastener (Small) (8 Required) For Tinted Plexiglass	282-1044
	Pushnut Fastener (Large) (2 Required) For Tinted Plexiglass	282-1050
	Front Panel Assy - Complete	311-1066-1
	Front Panel Only	260-1067
	Snap Button (Large-Black) for CRT Cable Hole	282-1037
	Dial Cord	262-1001

$\triangle 1$  F1 is 0.4AMP, 250V P/N 451-1014 in 240V units.  
 $\triangle 2$  R13 may be 2.2Meg,  $\pm 20\%$ , 1/2W P/N 326-1081 in some units.  
 $\triangle 3$  See Service Note No. 7. — See Page 2



\*USED IN MODEL 20B ONLY

- NOTES: 1. ALL SWITCHES SHOWN IN EXTREME CCW POSITION AS SEEN FROM THE FRONT.  
 S1 - EXT.  
 S2 - OFF  
 S3 - MONO
2.  $\perp$  SIGNAL GROUND  
 3.  $\text{---}$  CHASSIS GROUND

- ⚠ \*\*R13 VALUE MAY VARY FROM UNIT TO UNIT FROM 2.2 MEG TO 3.3 MEG 1/2 WATT
- ⚠ SEE SERVICE NOTE NUMBER 7 ON PAGE 2.
- ⚠ F1 IS 0.4 AMPS, 250 VOLTS ON 240 VOLT MODELS.

FIGURE 18 - MODEL 20 UNIT SCHEMATIC

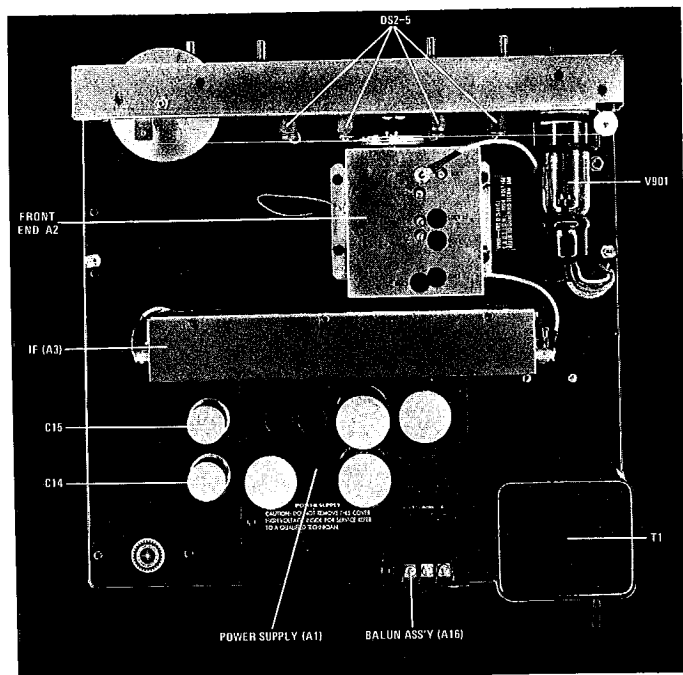


FIGURE 17A - MODEL 20 TOP VIEW

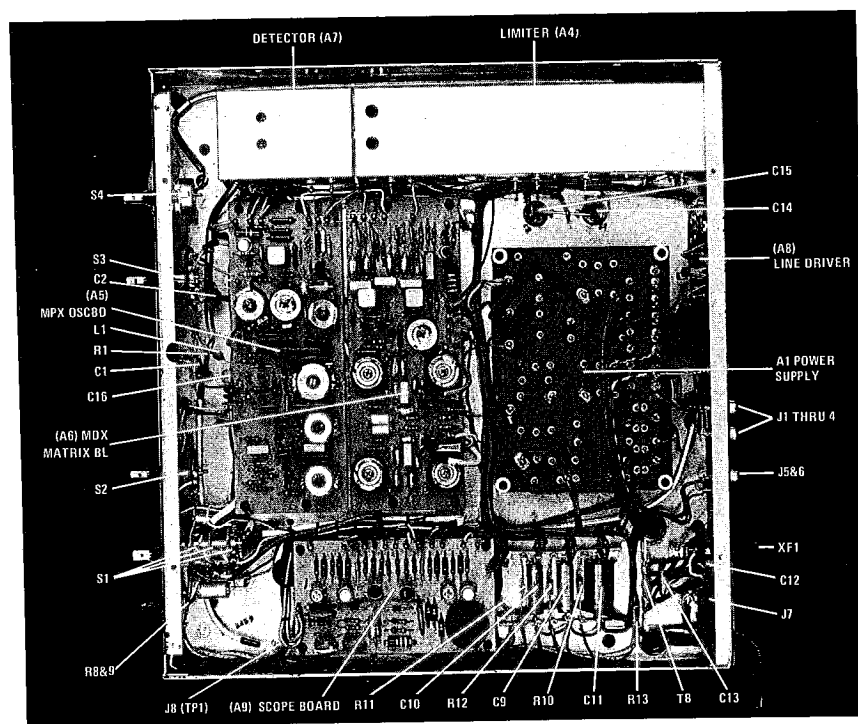


FIGURE 17B - MODEL 20 BOTTOM VIEW

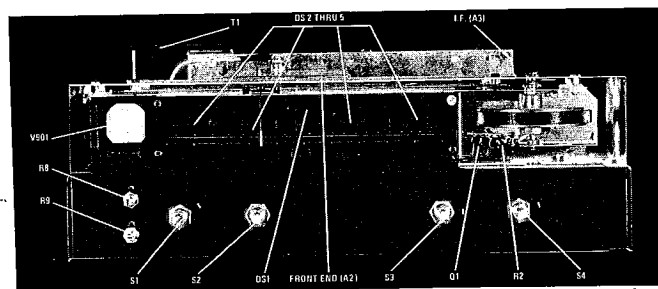


FIGURE 17C - MODEL 20 FRONT VIEW

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