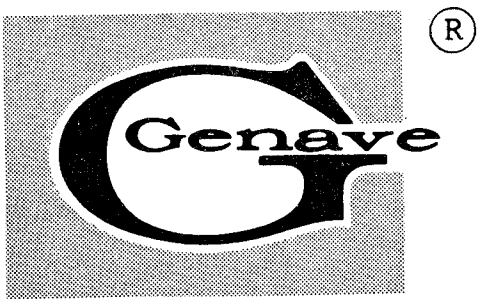

50-WATT PEP LINEAR AMPLIFIER

OWNER'S MANUAL

Genave

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Specifications subject to change without notice

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CONTENTS

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

A linear amplifier provides a means of increasing the amplitude-modulated RF output from a low-powered transmitter. As its name implies, the resultant output signal is an exact, amplified reproduction of the driving signal.

Linear amplifiers have been popular for many years in broadcast- and amateur-radio stations because of the small exciter power required and the elimination of cumbersome, expensive high-level plate-modulation equipment.

In considering the practicality of adding a linear amplifier to an existing AM transmitter, it is necessary to know the PEP output of the transmitter, as well as the PEP output rating of the proposed amplifier.

> NOTE: At 100% amplitude-modulated PEAKS, the PEP output is 4 times the CARRIER level; thus, a 3-watt carrier becomes 12-watts PEP at 100% modulation.

Therefore, if the linear has a PEP output rating that is four times the PEP rating of the existing AM transmitter, the output will be "quadrupled" --- a 6-dB improvement. In most cases, a 3-dB change is "just discernible" by the receiving operator.

1-2. DESCRIPTION

The Genave 50-watt PEP Linear Amplifier is an all solid-state option, designed especially for "factory-installation" in Genave Alpha-12 or Alpha/720 aviation band communications transceivers.

The amplifier consists of a printed-circuit board assembly mounted on a large, finned heatsink. The PC board contains RF-power transistor Q702 and its associated circuitry.

NPN transistor Q701, clamped between the PC board and the heatsink, is connected as a diode and establishes a fixed value of forward bias for power amplifier Q702. Current through bias transistor Q701 varies in direct proportion with the supply voltage, tending to hold the no-signal collector current of Q702 at a steady value.

Since Q701 is clamped to the heatsink close to amplifier Q702, it provides protection against bias changes brought about by temperature excursions. That is, as the temperature of the heatsink increases so does the current through Q701, thus lowering bias voltage applied to amplifier Q702; thereby, protecting Q702 against "thermal runaway."

When the transmitter is keyed, +13.75 VDC is applied to the amplifier bias circuit, consisting of Z701, R701, Z-702, R702, and diode-connected bias transistor Q701. This forward-biases Q702 for Class AB operation. Therefore, under these conditions the collector current of Q702 runs approx. 400 mA with no RF drive, and peaking at approx 6.8 amps with 50-watts PEP output.

The RF input signal from the driver is applied to base of amplifier Q702 by means of a 50-ohm, broadband input circuit, consisting of etched PC inductor L701, capacitors C702, C703, C707, and C708. C701 also serves as a DC blocking capacitor.

The amplified output of Q702 is developed across collector load L702. C711, C712, C713, and etched inductor L703 comprise a broadband, resonant matching network which matches the output of Q-702 to the 52-ohm antenna impedance. C714 serves as a blocking capacitor to couple the RF output to the antenna relay via a short coaxial cable.

When the Linear Amplifier is used in conjunction with either the Alpha-12 or

Alpha/720 transceiver, the existing rear panel of the unit is removed and replaced by the heatsink assembly containing the amplifier PC board, the antenna connector, and the male 15-pin "accessory connector." To provide the additional depth required by the amplifier assembly, an "extender" bracket is added to each siderail of the transceiver; then, the heatsink is mounted to these extenders. Because of the greater depth of the modified unit, the original top and bottom covers are replaced with new covers of the necessary length.

1-3. SPECIFICATIONS

Frequency Range:	118 - 136 MHz
Input Voltage:	13.75 VDC
Input Current:	Static or idle: 0.4 amps
	Unmodulated carrier: 5.5 amps
	Voice peaks (@ 100% mod): 6.8 amps
Input Driving Power:	3 watts (unmodulated carrier)
	12 watts PEP (@ 100% modulation)
Power Output:	12.5 watts (unmodulated carrier)
	50 watts PEP (@ 100% modulation)
Input Impedance:	50-ohms, unbalanced
Output Impedance:	50-ohms, unbalanced

1-4. AMPLIFIER CONNECTIONS

The 50-watt PEP amplifier is intended to be a "factory-installed" option only; therefore, no amplifier installation instructions are provided in this manual.

For troubleshooting purposes, however, a schematic diagram of the amplifier is given in Figure 1-1. Figure 1-2 is a schematic of the connections required when the amplifier is installed in an Alpha-12 transceiver; whereas, Figure 1-3 is a schematic of the amplifier installed in a Genave Alpha/720 unit.

In general, the following comments apply to the amplifier connections:

1) The connection between the ant. relay and the transmitter output filter is broken; then, the amplifier is connected between these two points.

2) The amplifier collector supply (at feedthru capacitor C709) is obtained from the +13.75 volt line which is controlled by the transceiver ON/OFF switch. Due to the magnitude of current for Q702, it is not feasible to obtain this supply through contacts on keying relay K101.

3) Voltage to bias Q702 in Class AB (at feedthru capacitor C705) is obtained from the +13.75 volt line which is energized by the transceiver relay K101.

1-5. AMPLIFIER ADJUSTMENTS

The transceiver and its linear amplifier are properly aligned before shipment, and realignment should never be necessary during normal life of the unit unless components within the instrument are replaced.

NEVER attempt to realign the transceiver or amplifier circuits unless the test equipment specified for each section is available.

To align transceiver and/or amplifier circuits, refer to the appropriate Maintenance Manual (Alpha-12 or Alpha/720), as well as to Section 1-5 and Figures 1-2 and 1-3 of this manual.

The following test equipment is needed for proper adjustment of the 50-watt PEP amplifier:

a) Sweep Generator, 1 mW or more, 118 to 136 MHz, Texscan VS-80 or equivalent.

b) 118 and 136 MHz Marker Crystals for sweep gen., or use an RF signal generator to supply the marker signals.

c) 50-ohm Attenuators, rated for 50 watts minimum. Total attenuation approx. 36 dB.

d) 50-ohm RF Detector, to cover 118 to 136 MHz frequency range.

e) Oscilloscope, with provisions for external horizontal-sweep input.

f) While not required, a peak reading RF power meter, such as a Bird Model 4311 with 100-watt element is useful.

To adjust the amplifier circuits, first remove the transceiver top and bottom covers; then remove screws securing the rear-panel heatsink to the two chassis siderails. Lay heatsink down on its fins -- be sure a ground exists between heatsink and the transceiver chassis. Remove cover from over amplifier PC board to gain access to amplifier trimmer capacitors, and components.

Unsolder input coax from C701 and output coax from C714; now solder the two coax center conductors together -- this will bypass the amplifier temporarily, allowing the transceiver transmitter to be checked or adjusted as necessary. Refer to the Alpha-12 or Alpha/720 Maintenance Manual for adjustment procedures.

After the transceiver transmitter is ascertained to be operating correctly, resolder the amplifier input coax to C701 and the output coax to C714. The transceiver RF output will now be applied to the antenna connector THROUGH THE LINEAR AMPLIFIER.

Connect test equipment to transceiver as shown in Figure 1-0. Note that RF output of sweep generator is applied to J301 in the Alpha-12, or to C514 in the Alpha/720.

Set transceiver frequency selector to a frequency above 130 MHz. Apply 13.75 V to transceiver, and allow unit to stabilize for approximately 10 minutes. Adjust sweep generator to sweep a range slightly in excess of 118 - 136 MHz.

Key transmitter, without modulation, and adjust trimmers C702, C711, and C713 in amplifier for maximum amplitude and flattest response on the scope from 118 to 136 MHz.

Change transceiver frequency selector to a frequency BELOW 130 MHz. Again key transceiver, and note amplitude and flatness of response on scope. If necessary, adjust amplifier trimmers very slightly.

Set transceiver frequency selector to a frequency ABOVE 130 MHz. Key transceiver, and note response on scope. The amplifier output should be essentially flat from 118 to 136 MHz, although it may show a slight dip in mid-band.

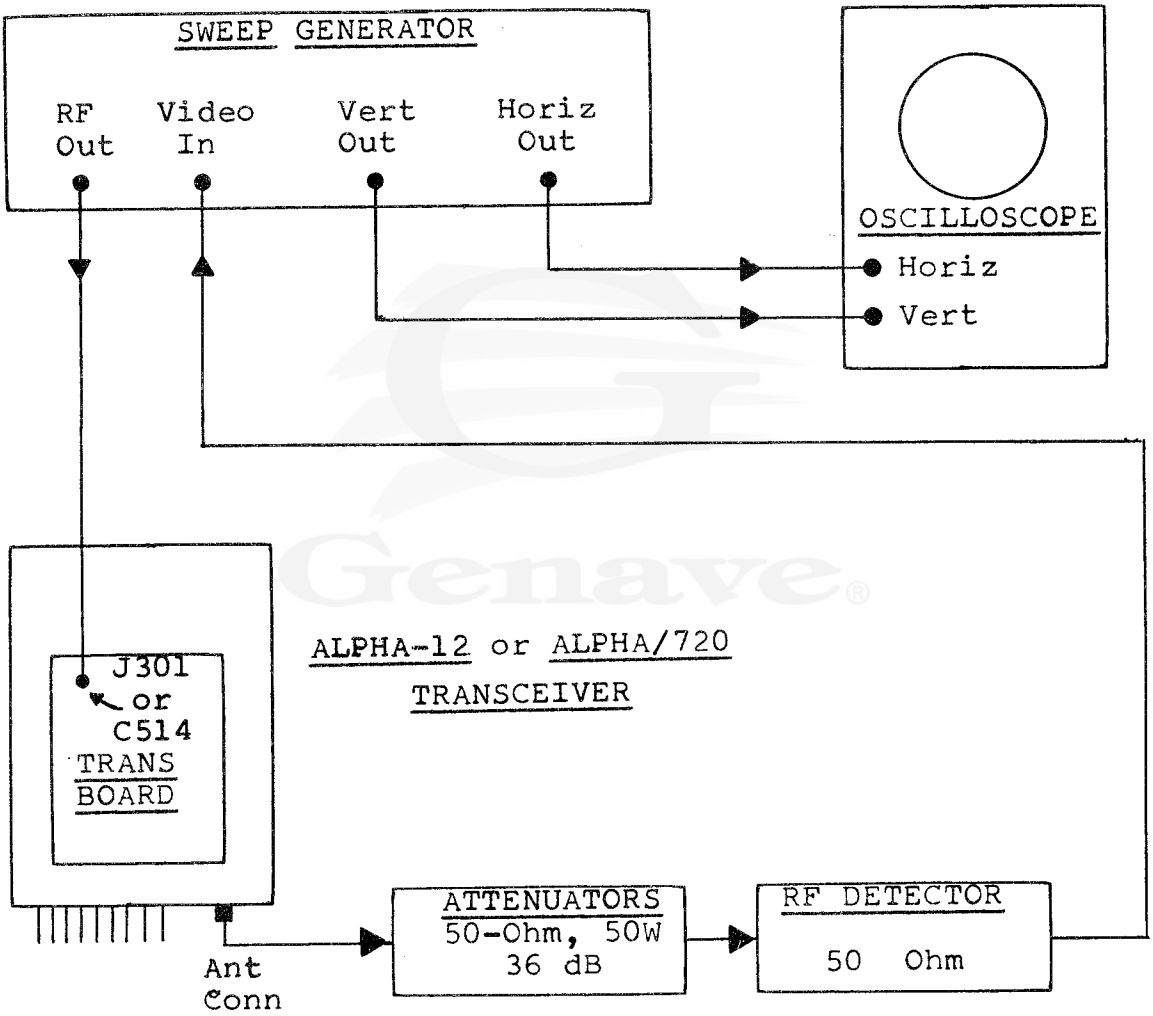


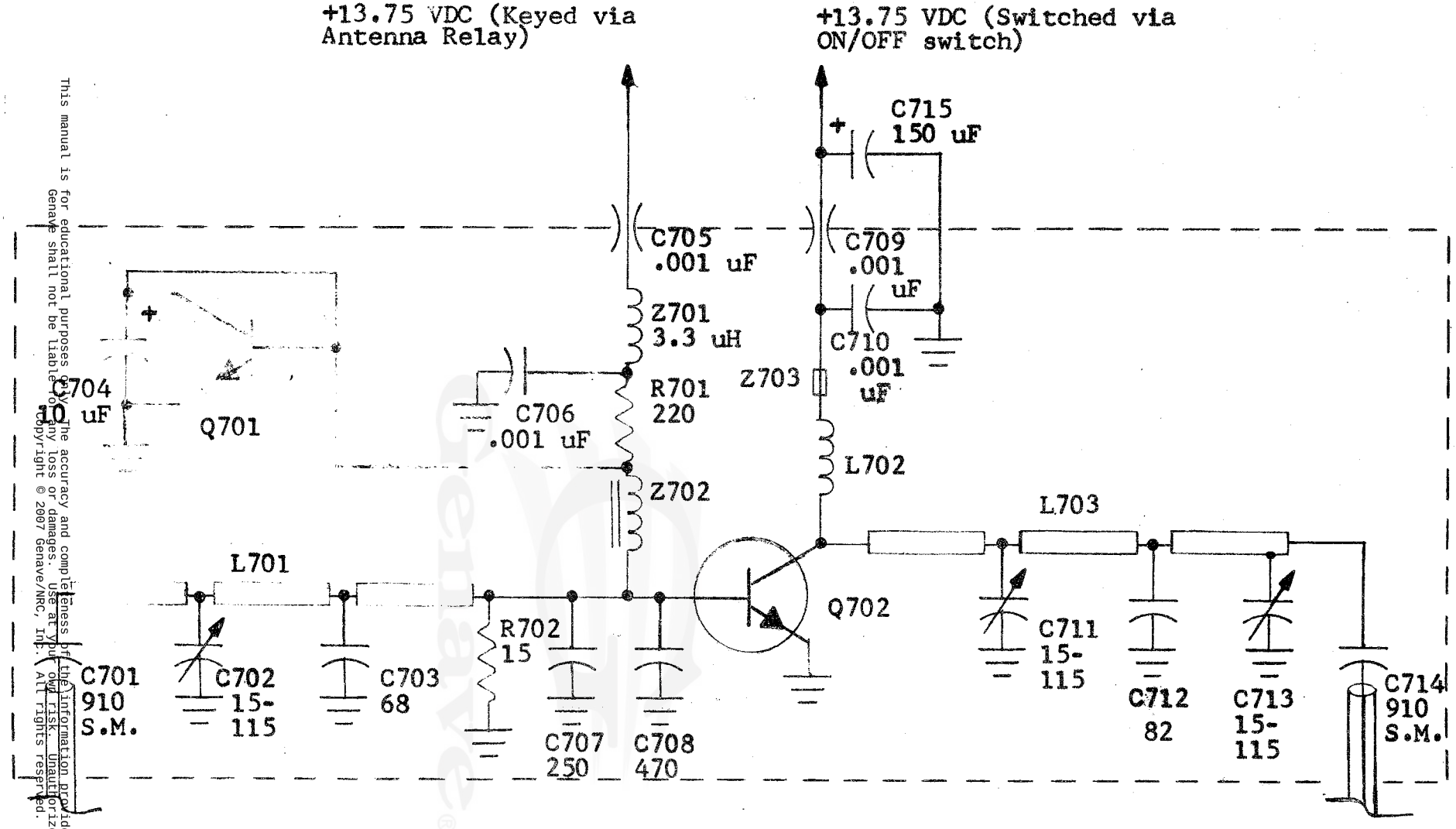
Figure 1-0, Amplifier Alignment Set-Up

Key transceiver, and apply modulation of approximately 1 kHz by whistling into transceiver microphone. The scope pattern should double in amplitude during modulation, indicating a four times increase in power output with full modulation. The modulation percentage may be somewhat less than 100% at the high end of the band; however, it should be possible to attain a minimum of 75 to 80%.

NOTE: Even with the amplifier carefully adjusted for maximum amplitude and flattest response over the frequency range, it may not modulate properly, particularly on positive peaks. In this event, adjust C702, C711, and C713 in the amplifier while whistling into microphone and observing scope pattern. Adjust for best modulation over the frequency range. The UNMODULATED carrier power should be 12.5 watts over the 118 - 136 MHz frequency range, and the PEP output should be 50 watts.

Really effective adjustment of a linear amplifier is a complex process, which requires that collector and base circuits must be carefully tuned for maximum amplifier output, and the drive level must be low enough so there is no distortion, yet high enough so that maximum efficiency is obtained, and the amplifier must be loaded properly.

After the amplifier is properly adjusted, remove test equipment from transceiver. Reconnect any wires or plugs that were disconnected in transceiver. Reinstall heatsink on chassis siderails, and replace instrument top and bottom covers.



NOTES:

1. Capacitors are in picofarads, unless otherwise noted.
2. Resistances are in ohms.
3. Inductors L701 and L703 are etched on PC board, and tapped at points where capacitors connect.

Figure 1-1. Linear Amplifier Schematic

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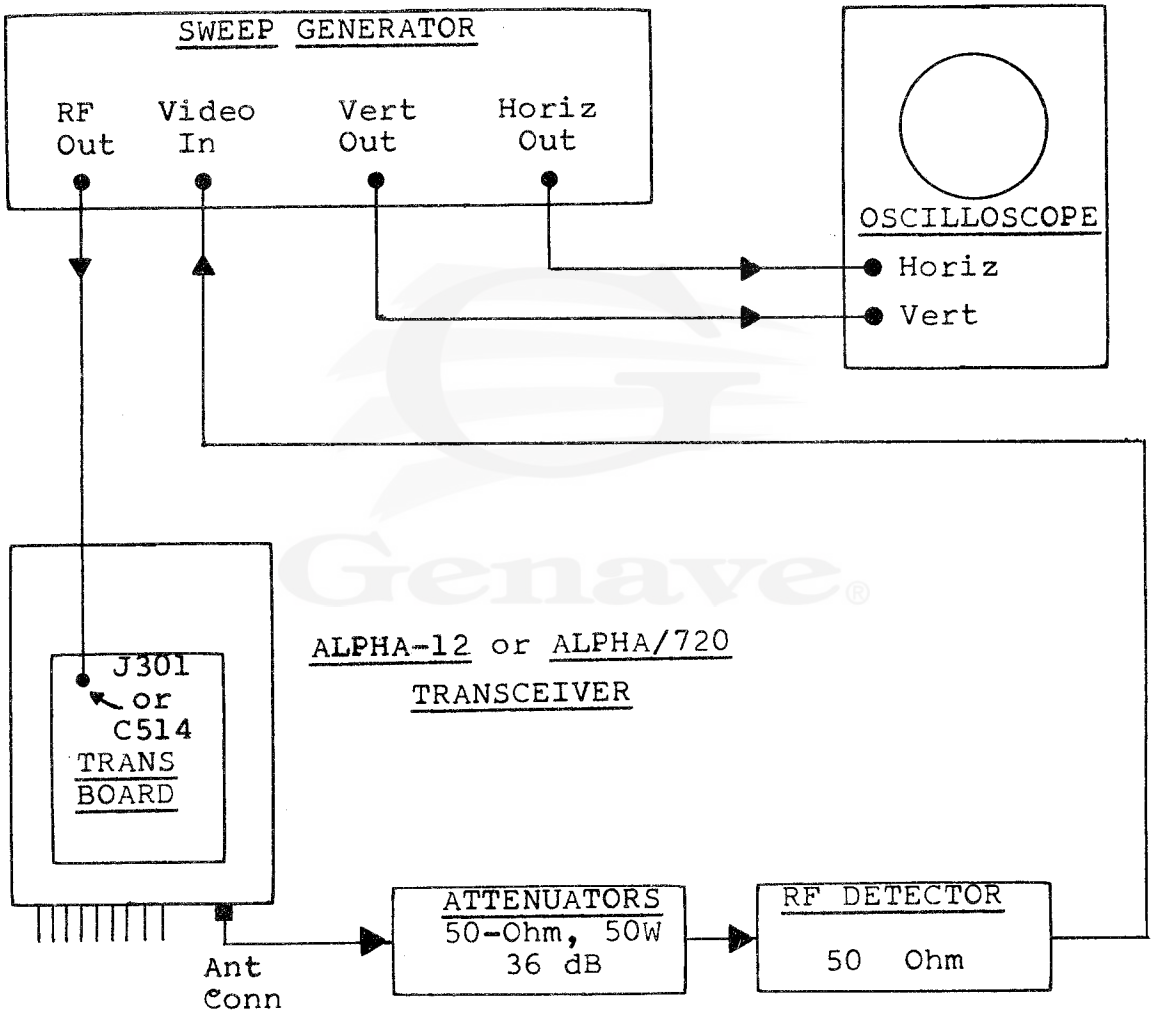
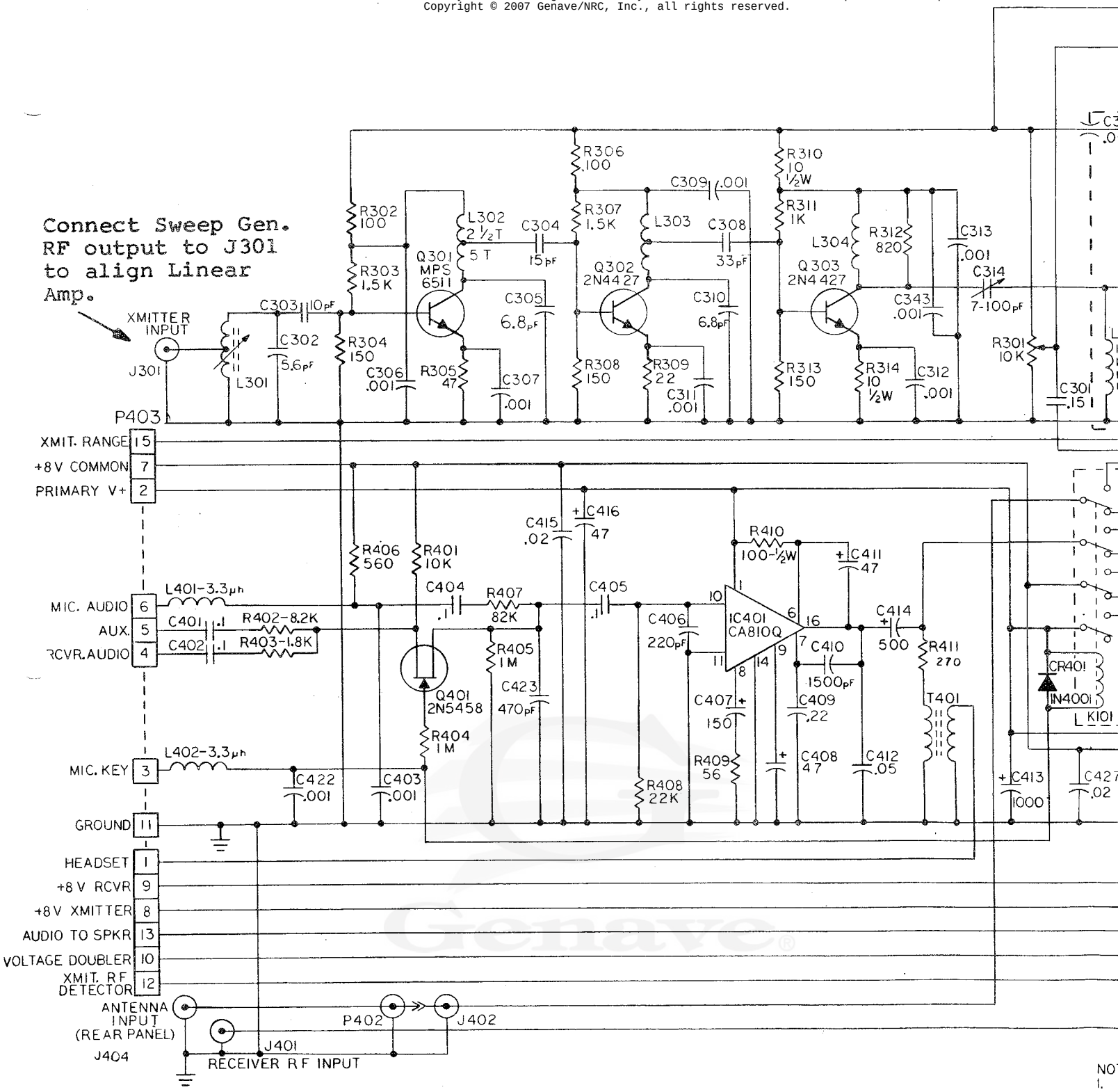
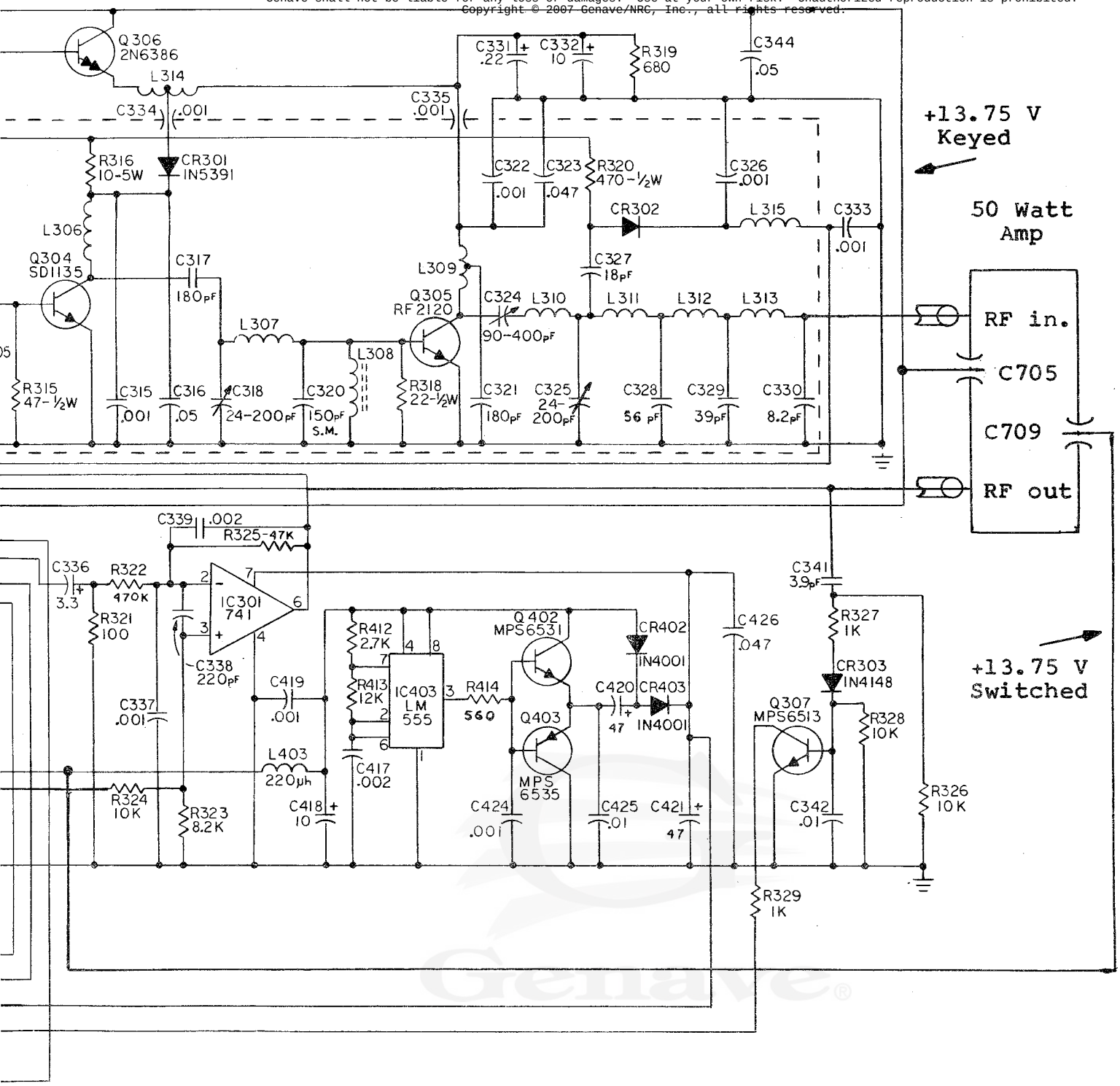


Figure 1-0. Amplifier Alignment Set-Up

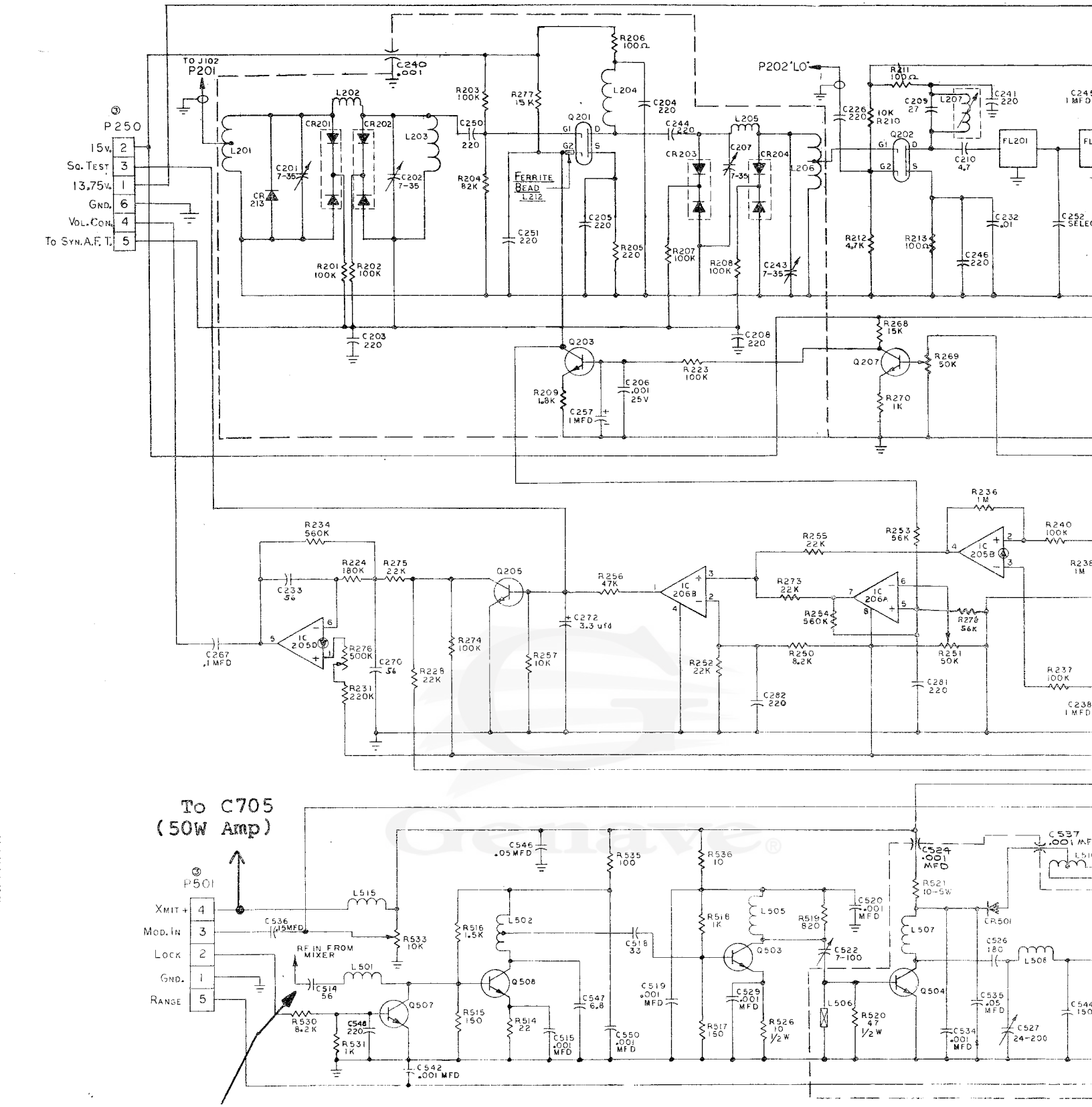




S:
APACITANCE IN MICROFARAD UNLESS OTHERWISE
PECIFIED.
ESISTANCE IN OHMS.

ALPHA/12
TRANSMITTER-AUDIO
BOARD

Figure 1-2. Transmit/Audio Board Schematic, With 50-Watt Amplifier



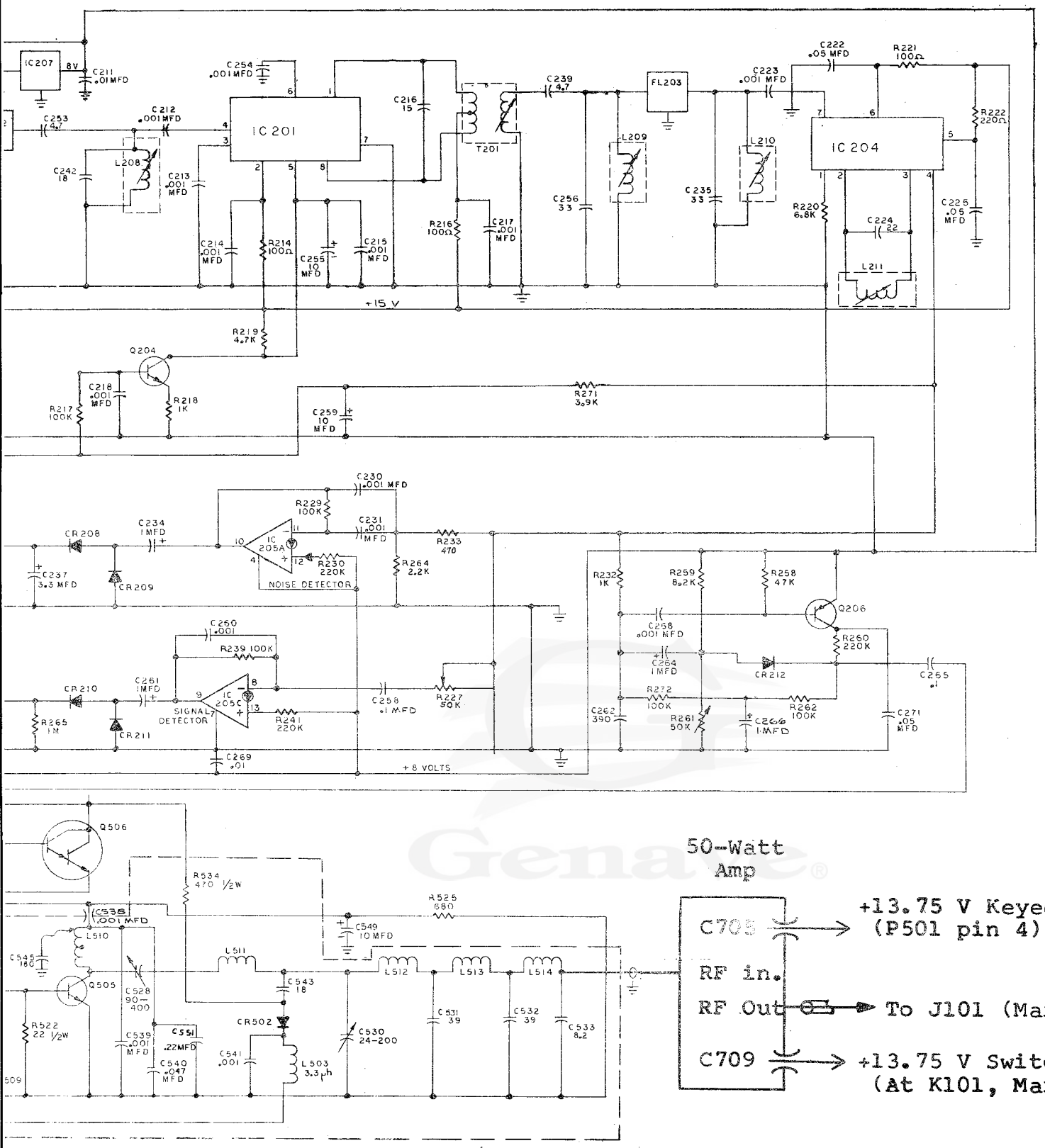


Figure 1-3. Rec/Trans. Board Schematic, With 50-Watt Amplifier

PARTS LIST

The first column in the Parts List contains component-reference numbers. The three-digit circuit reference on the schematic is represented in the REFERENCE NUMBER column by the last one or two digits. The first digit represents the assembly, or section, of unit in which the part is located. The assembly or section number (700, for example) is indicated next to the reference number heading; that is, CAPACITORS C700, etc.

Genave part numbers for replaceable items appear in the PART NUMBER column, while a brief description for each part is shown in the DESCRIPTION column.

Reference Number	Part Number	Description
CAPACITORS C700		
1, 14	1530009	Sil. Mica, 910 pF ±5%
2, 11, 13	1560406	Trimmer, 15 - 115 pF, Arco #406
3	1520240	Unelco, 68 pF uncased mica
4	1550007	Tant., 10 uF ±20%, 35V
5, 9	1520086	Feedthru, .001 uF, BBBK-5
6, 10	1520071	JF Disc, .001 uF, 1000V
7	1520238	Unelco, 250 pF uncased mica
8	1520239	Unelco, 470 pF uncased mica
12	1520241	Unelco, 82 pF uncased mica
15	1540023	Elect., 150 uF, 16V
INDUCTORS L700		
1, 3	---	Etched on PC board
2	1800258	Coil, 7-1/2 turns #18
TRANSISTORS Q700		
1	4800013	Silicon, NPN, audio, MJE520
2	4800074	Silicon, NPN, RF Power, SRF2975
RESISTORS R700		
1	4730009	220 ohm ±10%, 1W
2	4710002	15 ohm ±10%, 1/4W

Reference Number	Part Number	Description
CHOKES Z700		
1	1800329	3.3 uH, Wilco ML33G
2	1800339	Choke, 2-1/2 turns, VK200-19-4B
3	1870005	Core, tuning, 51-5410-25
MISCELLANEOUS		
	2510566	Shield, amplifier
	2510565	Cover, amplifier
	2510552	Extenders, chassis
	2510535	Heatsink (modified)
	2510553	Cover, radio (top or bottom)