



50 ohms

GENERAL  ELECTRIC

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WARNING

Although the highest DC voltage in the MASTR II Station Transmitter is the 12 VDC Supply Voltage, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. KEEP AWAY FROM THESE CIRCUITS WHEN THE TRANSMITTER IS ENERGIZED!

DESCRIPTION

These MASTR®II transmitter Types KT-50-A, C; KT-51-A, C and KT-52-A, C are crystal-controlled, phase modulated transmitters designed for one through four-frequency operation in the 450 to 512 megahertz band. The solid state transmitter utilizes both integrated circuits (ICs) and discrete components, and consists of the following assemblies:

Exciter Board; with audio, modulator, amplifier and multiplier stages.

Power Amplifier Assembly; with amplifier, driver, PA, power control, filter and antenna switch.

Centralized metering jack J103 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The test set meters the modulator, multiplier and amplifier stages, and the regulated 10-Volts.

ICOMS

Three different types of ICOMs are available for use in the exciter. Each of the ICOMs contains a crystal-controlled Colpitts oscillator, and two of the ICOMs contain compensator ICs are:

5C-ICOM - contains an oscillator and a 5 part-per-million ($\pm 0.0005\%$) compensator IC. Provides compensation for EC-ICOMs.

EC-ICOM - contains an oscillator only. Requires external compensation from a 5C-ICOM.

2C-ICOM - contains an oscillator and 2 PPM ($\pm 0.0002\%$) compensator IC. Will not provide compensation for an EC-ICOM.

CIRCUIT ANALYSIS

EXCITER

The exciter uses seven transistors and one integrated circuit to drive the PA assembly. The exciter can be equipped with up to four Integrated Circuit Oscillator Modules (ICOMs). The ICOM crystal frequency ranges from approximately 12.5 to 14.2 megahertz, and the crystal frequency is multiplied 36 times.

Audio, supply voltages and control functions are connected from the system board to the exciter board through P902.

The ICOMs are enclosed in an RF shielded can with the type ICOM (5C-ICOM, EC-ICOM or 2C-ICOM) printed on the top of the can. Access to the oscillator trimmer is obtained by prying up the plastic tab on the top of the can. The tabs can also be used to pull the ICOMs out of the radio.

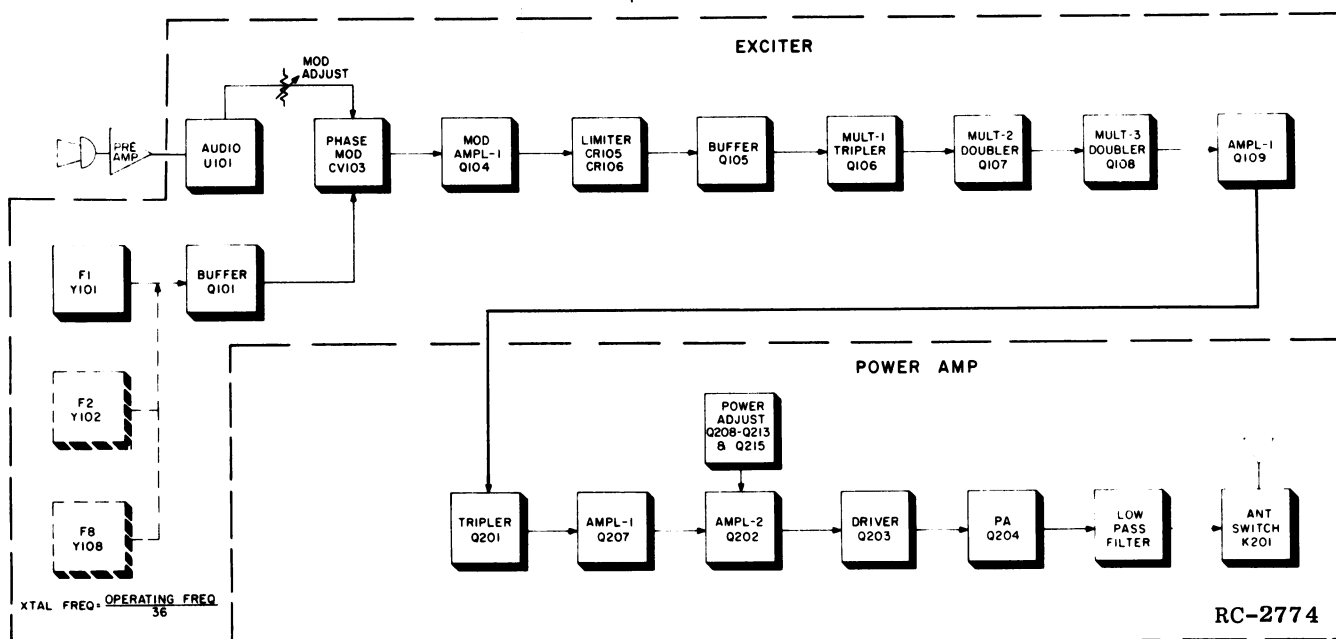


Figure 1 - Transmitter Block Diagram

Frequency selection is accomplished by switching the ICOM keying lead (terminal 6) to A-. The oscillator is turned on by applying a keyed +10 Volts to the external oscillator load resistor.

CAUTION

All ICOMs are individually compensated at the factory and cannot be repaired in the field. Any attempt to repair or change an ICOM frequency will void the warranty.

In transmitter types KT-50-A, C, using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 8 EC-ICOMs in the transmit and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (5 Volts) from the 10-Volt regulator IC. If desired, up to 8 5C-ICOMs may be used in the radio. In transmitter types KT-51-A, C and KT-52-A, C at least one 5C-ICOM is required for the transmitter and at least one 5C-ICOM is required for the receiver.

The 2C-ICOMs are self-compensated at 2 PPM and will not provide compensation for EC-ICOMs.

Oscillator Circuit

The quartz crystals used in ICOMs exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

At both the coldest and hottest temperatures, the frequency increases with increasing temperature. In the middle temperature range (approximately 0°C to 55°C), frequency decreases with increasing temperature.

Since the rate of change is nearly linear over the mid-temperature range, the output frequency change can be compensated by choosing a parallel compensation capacitor with a temperature coefficient approximately equal and opposite that of the crystal.

Figure 2 shows the typical performance of an uncompensated crystal as well as the typical performance of a crystal which has been matched with a properly chosen compensation capacitor.

At temperatures above and below the mid-range, additional compensation must be introduced. An externally generated compensation voltage is applied to a varactor (voltage-variable capacitor) which is in parallel with the crystal.

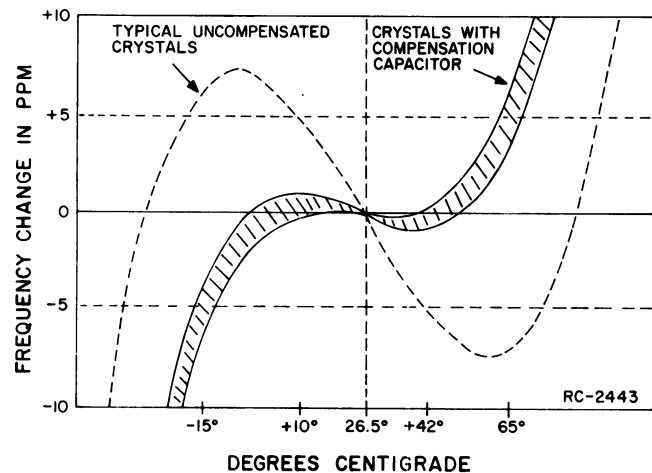


Figure 2 - Typical Crystal Characteristics

In transmitter types KT-50-A, C, a constant bias of 5 Volts (provided from Regulator IC U901 in parallel with the compensator) establishes the varactor capacity at a constant value over the entire mid-temperature range. With no additional compensation, all of the oscillators will provide 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F).

Compensator Circuits

Both the 5C-ICOMs and 2C-ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation. An equivalent ICOM circuit is shown in Figure 3.

The cold end compensation circuit does not operate at temperatures above 0°C. When the temperature drops below 0°C, the circuit is activated. As the temperature decreases, the equivalent resistance decreases and the compensation voltage increases.

The increase in compensation voltage decreases the capacity of the varactor in the oscillator, increasing the output frequency of the ICOM.

The hot end compensation circuit does not operate at temperatures below +55°C. When the temperature rises above +55°C, the circuit is activated. As the temperature increases, the equivalent resistance decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacity of the varactor, decreasing the output frequency of the ICOM.

SERVICE NOTE: Proper ICOM operation is dependent on the closely-controlled input voltages from the 10-Volt regulator. Should all of the ICOMs shift off frequency, check the 10-Volt regulator module or check output of 5C-ICOM.

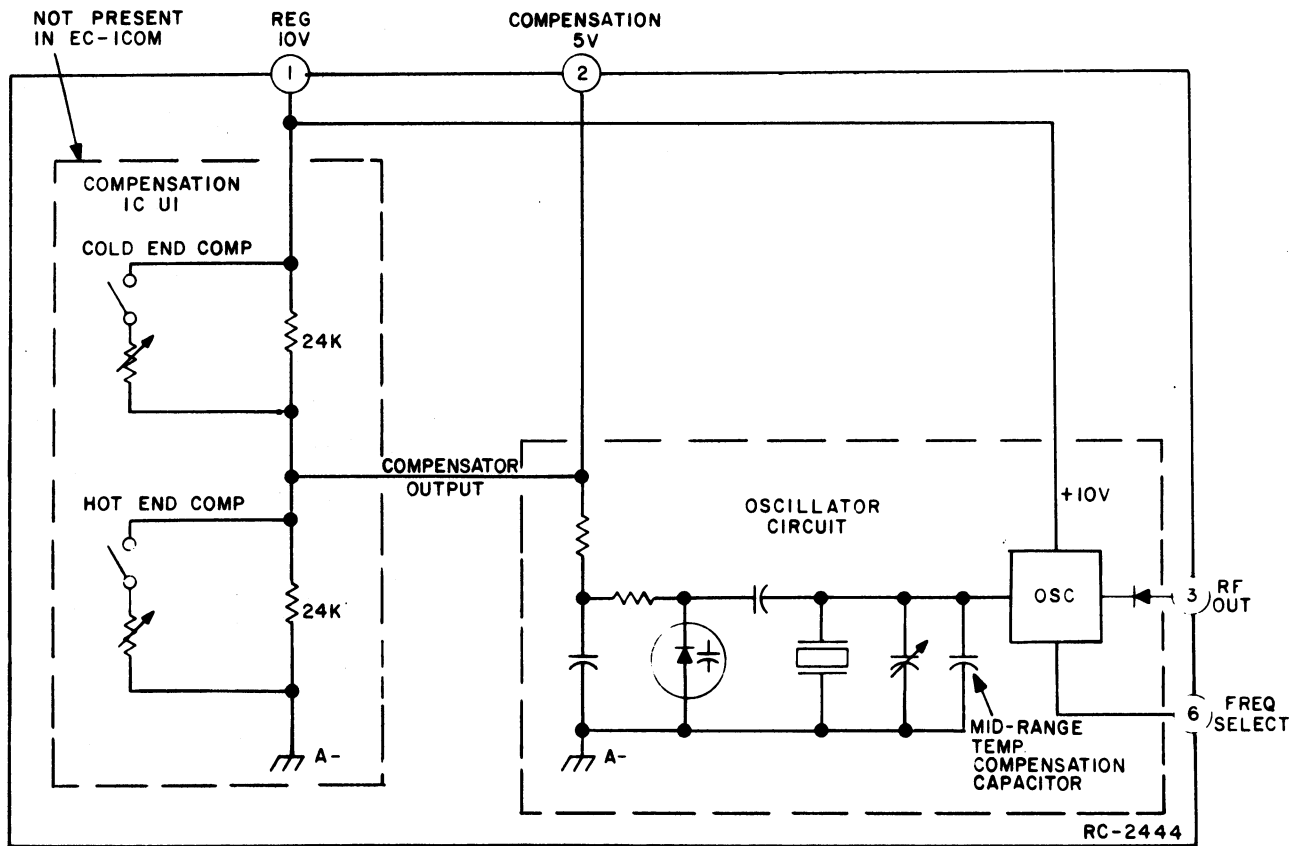


Figure 3 - Equivalent ICOM Circuit

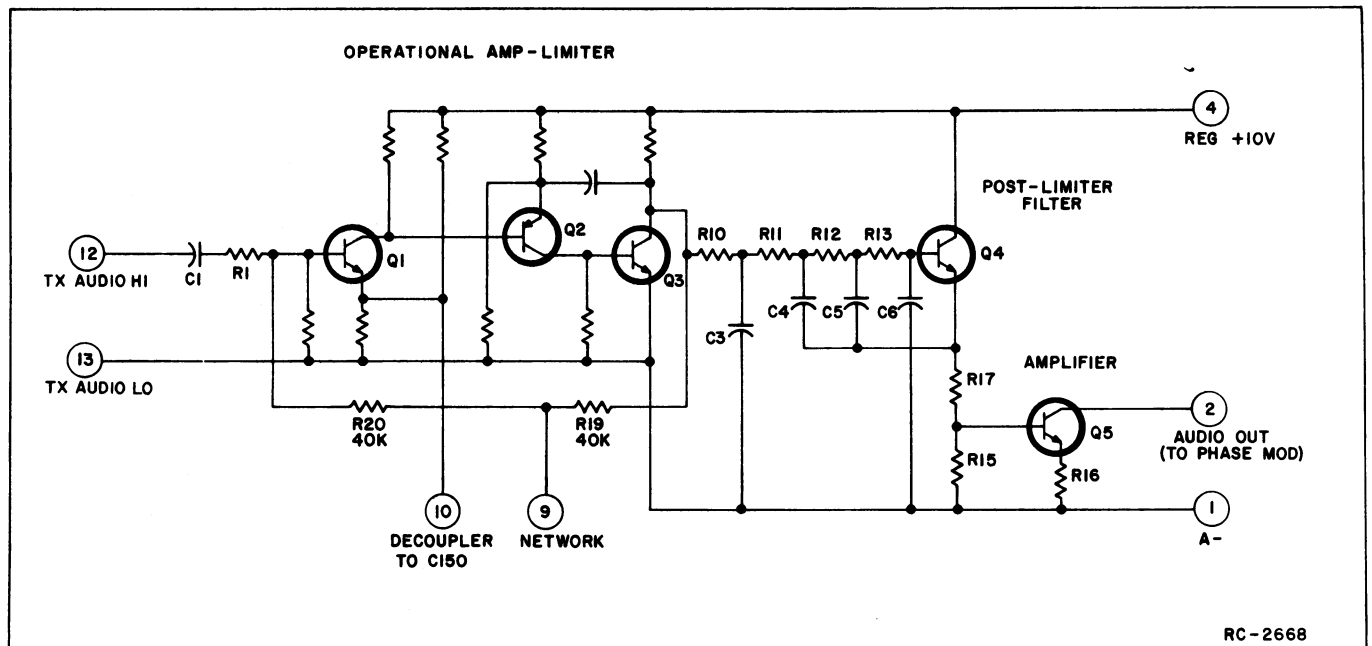


Figure 4 - Simplified Audio IC

AUDIO IC

The transmitter audio circuitry is contained in audio IC U101. A simplified drawing of the audio IC is shown in Figure 4.

Audio from the station preamplifier at pin 12 is coupled through pre-emphasis capacitor C1 to the base of Q1 in the operational amplifier-limiter circuit.

The operational amplifier-limiter circuit consists of Q1, Q2 and Q3. Q3 provides limiting at high signal levels. The gain of the operational amplifier circuit is fixed by negative feedback through R19, R20 and the resistance in the network (Pin 9).

The output of Q3 is coupled through a de-emphasis network (R10 and C3) to an active post-limiter filter consisting of C4, C5, C6, R11, R12, R13, R15, R17 and Q4.

Following the post-limiter filter is class A amplifier Q5. The output of Q5 is coupled through MOD ADJUST potentiometer R104 and resistor R125 to the phase modulator.

SERVICE NOTE: If the DC voltages to the Audio IC are correct and no audio output can be obtained, replace U101.

For radios equipped with Channel Guard, tone from encoder is applied to the phase modulator through CHANNEL GUARD MOD ADJUST potentiometer R105, and resistor R127. Instructions for setting R105 are contained in the modulation adjustment section of the Transmitter Alignment Procedure.

BUFFER, PHASE MODULATORS & AMPLIFIERS

The output at pin 3 of the selected ICOM is coupled through buffer-amplifier Q101 to the modulator stage. The phase modulator is varactor (voltage-variable capacitor) CV103 in series with tunable coil T103. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator circuit through blocking capacitor C107 varies the bias of CV103, resulting in a phase modulated output. A voltage divider network (R110 and R111) provides the proper bias for varactor CV103.

The output of the modulator is coupled through blocking capacitor C150 to the base of Class A amplifier Q104. The output of the modulator is metered through C123, R128 and CR104, and is applied to the base of buffer Q105. Diodes CR105 and CR106 remove any amplitude modulation in the modulator output.

BUFFER, MULTIPLIERS & AMPLIFIER

Buffer Q105 is saturated when no RF signal is present. Applying an RF signal

to Q105 provides a sawtooth waveform at its collector to drive the class C tripler, Q106. The tripler stage is metered through R138. The output of Q106 is coupled through tuned circuits T104 and T105 to the base of doubler Q107. The doubler stage is metered through R141.

The output of Q107 is coupled through tuned circuits T106 and T107 to the base of second doubler Q108. Q108 is metered through R146.

The output of Q108 is coupled through three tuned circuits (T108, T109 and T110) to the base of amplifier Q109.

Q109 is a Class C amplifier, and is metered through R148. The amplifier collector circuit consists of T111, C154, C155, T112 and C157, and matches the amplifier output to the input of the power amplifier assembly.

POWER AMPLIFIER

The PA assembly uses five RF power transistors and seven transistors in the Power Control circuitry to provide rated power output. The broadband PA has no adjustments other than Power Control potentiometer R226.

Supply voltage for the PA is connected through power leads from the system board to feedthrough capacitors C297 and C298 on the bottom of the PA assembly. C297, C298, C299, L295 and L296 prevent RF from getting on the Power leads. Diode CR295 (on the intermittent duty PA only) will cause the main fuse in the fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

Centralized metering jack J205 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the Tripler drive (exciter output), Ampl-2 input, Driver and PA current.

TRIPLER & RF AMPLIFIERS

The exciter output is coupled through an RF cable to PA input jack J201. The 50-ohm RF input is coupled through a matching network (C205 and W209) to the base of the broadband tripler stage, Q201.

Part of the RF input is rectified by CR201 and is used to activate the Power Control circuit. Another portion of the rectified RF is applied to J205 for metering the tripler drive.

The output of Q201 is coupled through a collector matching network (C212, C213, C4219 and L203) to the input of a high-pass filter consisting of C217 through C225, and W210 through W213.

Following the high-pass filter is a low-pass filter consisting of W214 through W219 and C226 through C230. The two filter sections combine to act as a band-pass filter providing a minimum of 60 dB rejection below 300 megahertz and 30 dB rejection above 600 megahertz.

The filter output is coupled through a matching network (C231, C232, C233 and W220) to the base of Class C amplifier Q207. Collector voltage to Q207 is coupled through collector stabilizing network L220, R216, L219 and C234. The output of Q207 is coupled through a matching network (W221, C236, C237 and W222) to the base of the second Class C amplifier Q202. Drive to Q202 is metered at J205-4 (Ampl-2 Input) through metering network C238, CR202, C239 and R205.

Collector voltage for Q202 is coupled through stabilizing network L206, R206, L205 and C240. Matching network W223, C241, C242, C243 and W224 matches the output of Q202 to the base of driver Q203.

Collector voltage for Q203 is applied through stabilizing network R207, L209, L208, and C246.

The output of Q203 is coupled through a matching network (W225, C247, C248, C249 and W226) to the base of Class C PA Q204. Collector voltage for Q204 is applied through collector stabilizing network Z201, L211 and C4213.

Collector current for Q204 is metered across tapped manganin resistor R214 at J205 (PA Current). The reading is taken on the one-Volt scale with the High Sensitivity button pressed, and read as 10 amperes full scale.

Following Q204 are matching networks (W227 and C253; C4212 and W239) that match the PA output to the 50-ohm impedance of the low-pass filter.

The PA output is coupled through a low-pass filter to the antenna through antenna switch K201. Capacitors C214, C270 through C4218 provide DC ground isolation for $\pm$ ground operation.

WARNING

The stud mount RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic, or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

POWER CONTROL CIRCUIT

When the transmitter is keyed, rectified RF from CR201 is applied to the base of switch Q208, turning it on. Turning on

Q208 turns on voltage regulator Q210, supplying a constant voltage to Power Adjust potentiometer R226.

Q212, Q213 and Q215 operate as an amplifier chain to supply voltage to the collector of Q202 (Ampl-2). The setting of R226 determines the voltage applied to the base of Q212. The higher the voltage at the base of Q212, the harder the amplifiers conduct, supplying more collector voltage to Q202. The lower the voltage at the base of Q212, the less collector voltage is supplied to Q202. Reducing the supply voltage to Q202 reduces the drive to Q203 and Q204, thereby reducing the power output of the PA. The power output can be adjusted by R226 from approximately 6 to 20 Watts.

Temperature protection is provided by Q209, Q211 and thermistor RT201 which is mounted in the PA heatsink. Under normal operating conditions, the circuit is inactive (Q209 is on and Q211 is off). When the heatsink temperature reaches approximately 100°C, the resistance of RT201 decreases. This increases the base voltage applied to Q209, turning it off. Turning off Q209 allows Q211 to turn on, decreasing the voltage at Power Adjust potentiometer R226. This reduces the base voltage to Q212 which causes Q213 and Q215 to conduct less, reducing the collector voltage to Q202 (Ampl-2). This reduces the transmitter output power, keeping the heatsink at a maximum of approximately 100°C. When the heatsink temperature decreases below 100°C, the temperature control circuit turns off, allowing the normal transmitter power output.

MAINTENANCE

DISASSEMBLY

For a more complete mechanical parts breakdown refer to the station manual. To service the transmitter exciter from the front:

1. Turn the two latching knobs (A) counter-clockwise to unlatch the Radio Panel Front Door. Refer to Figure 5.
2. Swing the Radio Panel Front Door down as shown.
3. Remove covers.

To service the transmitter Power Amplifier from the rear:

1. Remove the top two screws (B) on the Intermittent or Continuous Duty Power Amplifier. Refer to Figure 6.
2. Swing the Power Amplifier down as shown. Remove the top cover of the Power Amplifier.

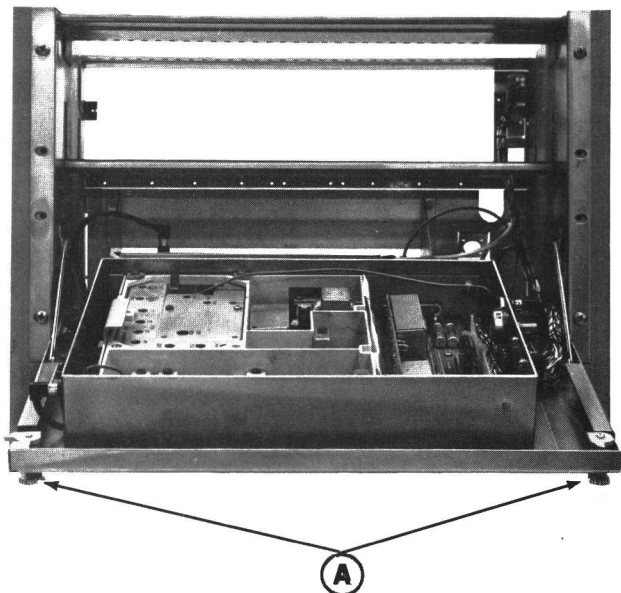


Figure 5 - Access to Exciter - Front View

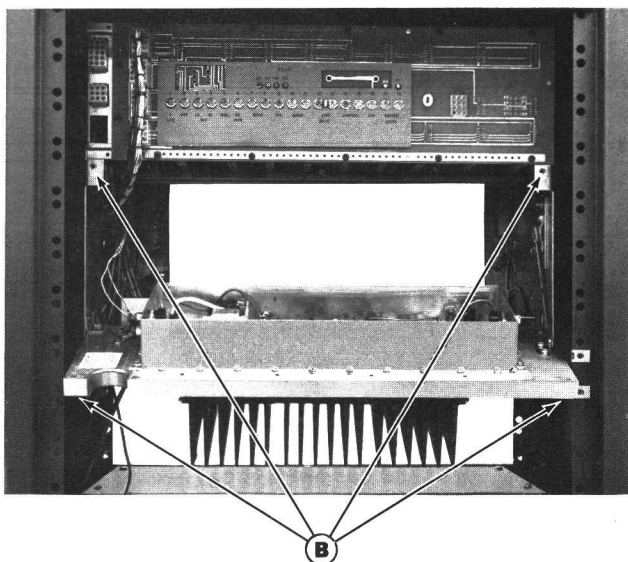


Figure 6 - Access To Power Amplifier - Rear View

NOTE

If the heatsink blower option is present, this blower must be removed before the Power Amplifier can be lowered.

To remove the PA board: Refer to Figure 7.

1. Remove the PA top cover and unplug the exciter/PA cable (B).

2. Unsolder the two feedthrough coils (E) and the thermistor leads (F).
3. For Continuous Duty stations only, remove all heatsink sections from the heat dissipator plate.
4. Remove the PA transistor hold-down nuts and spring washers on the bottom of the PA assembly.
5. Remove the four PA board mounting screws (G), the five screws in the filter casting (H), and the retaining screw in Q210 (J), and lift the board out.

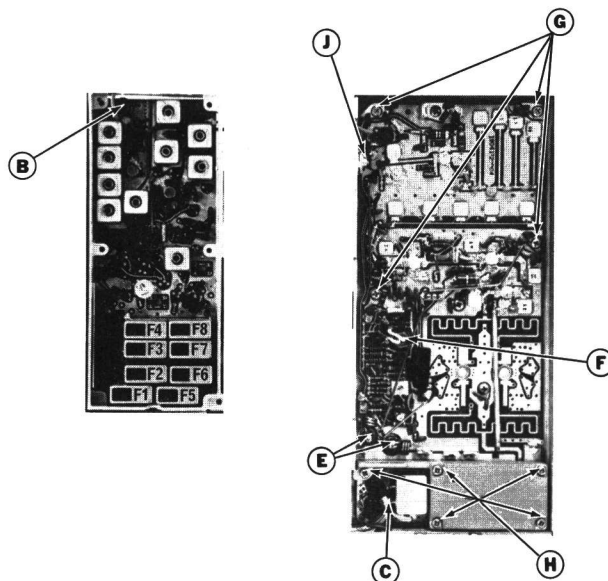


Figure 7 - PA Board Removal

PA TRANSISTOR REPLACEMENT

When replacing a power transistor where more than one are in parallel, make sure all the paralleled transistors are from the same manufacturer for proper operation.

WARNING

The stud mounted RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

To replace the PA RF transistors:

1. Unsolder one lead at a time with a 50-watt soldering iron. Use a scribe to hold the lead away from the printed circuit board until the solder cools.
2. Turn the transmitter.

NOTE

If the transmitter has a continuous Duty Power Amplifier a section of Heat Sink may have to be removed to get to the transistor hold-down nuts. Apply a light coat of silicon grease when replacing the removed section of Heat Sink.

3. Hold the body of the transistor to prevent it from turning. Remove the transistor hold-down nut and spring washer through the hole in the heatsink with an 11/32-inch nut-driver. Lift out the old solder from the printed circuit board with a de-soldering tool such as a SOLDA PULLT®. Special care should be taken to prevent damage to the printed circuit board runs.
4. Trim the new transistor leads (if required) to the lead length of the removed transistor. Cut the collector lead at a 45° angle for future identification (see Figure 8). The letter "C" on the top of the transistor indicates the collector.
5. Applying a coating of silicon grease around the transistor mounting surface,

and place the transistor in the mounting hole. Align the leads as shown in the Outline Diagram. Then hold the body of the transistor and replace the holding-down nut and spring-washer, using moderate torque (8 inch-pounds). A torque wrench must be used for this adjustment since transistor damage can result if too little or too much torque is used.

6. Make sure that the transistor leads are formed as shown in Figure 9 so that the leads can be soldered to the printed circuit pattern, starting from the inner edge of the mounting hole.
7. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hole and solder the remaining length of transistor lead to the board. Use care not to use excessive heat that causes the printed wire board runs to lift up from the board. Check for shorts and solder bridges before applying power.

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

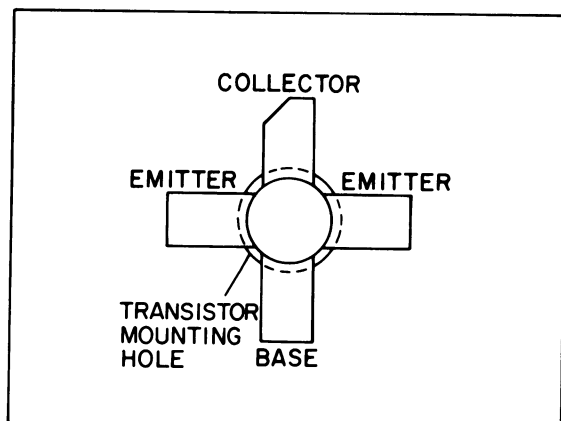


Figure 8 - Lead Identification

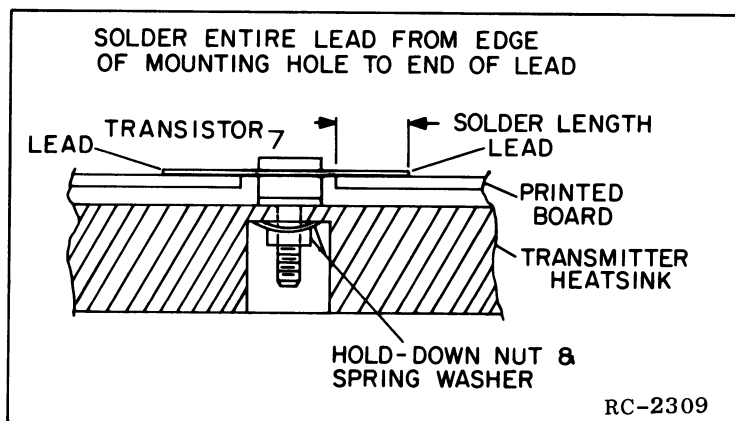


Figure 9 - Lead Forming

ICOM FREQUENCY ADJUSTMENT

The MOD ADJUST (R104) was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause overmodulation are clipped by the modulation limiter. The limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing over-modulation while preserving intelligibility.

TEST EQUIPMENT

- 1. An audio oscillator (GE Model 4EX6A10)
- 2. A frequency modulation monitor
- 3. An output meter or a VTVM
- 4. GE Test Set Model 4EX3A11 or 4EX8K12

PROCEDURE

- 1. Set the station gain control R14 to its fully clockwise position.
- 2. Connect the audio oscillator and the meter through a 0.5 μF (or larger) DC blocking capacitor, across audio input terminals J10 (Green-Hi) and J11 (Black-Lo) on GE Test Set, and connect the Red Test set plug to the system Red metering plug.
- 3. Set the audio generator frequency to 1 kHz.
 - A. In all station combinations except Local Control Intermittent Duty combinations, set the audio generator output to 30 millivolts RMS.
 - B. In Local Control Intermittent Duty station combinations, set the audio generator output to 1.0 volt RMS.
- 4. For transmitters without Channel Guard, set MOD ADJUST R104 for a 4.5 kHz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
- 5. For transmitters with Channel Guard set Channel Guard MOD ADJUST R105 for zero tone deviation. Next, with the 30 millivolts signal at 1000 Hz applied, set MOD ADJUST R104 for 3.75 kHz deviation. Then remove the signal from the audio oscillator and set Channel Guard MOD ADJUST R105 for 0.75 kHz tone deviation.
- 6. For multi-frequency transmitters, set the deviation as described in Steps 4 or 5 on the channel producing the largest amount of deviation.
- 7. Remove the audio oscillator and key the mike. While talking in a normal voice at a distance of four to six inches from the station microphone, adjust station gain control R14 for a deviation of 3 kHz as measured on the deviation monitor.

PA POWER INPUT

For FCC purposes, the PA power input can be determined by measuring the PA supply voltage and PA current, and using the following formula:

P_i = PA voltage x PA current

where:

P_i is the power input in Watts,

PA voltage is measured with Test Set Model 4EX3A11 in Position G on the 15-Volt range (read as 15 Volts full scale), and with the polarity switch in the (-) position. With Test Set Model 4EX8K12, use the B+ position and the 1-Volt range (read as 15 Volts full scale), with the HIGH SENSITIVITY button pressed and the polarity switch in the (-) position.

PA current is measured with the Test Set in Position G in the Test 1 position, and with the HIGH SENSITIVITY button pressed (10 amperes full scale).

Example:

P_i = 12.6 Volts x 2.5 amperes = 31.5 Watts

First, check the frequency to determine if any adjustment is required. The frequency should be set with a frequency meter or counter with an absolute accuracy that is 5 to 10 times better than the tolerance to be maintained, and with the entire radio as near as possible to an ambient temperature of 26.5°C (79.8°F).

MASTR II ICOMs should be reset only when the frequency shows deviation in excess of the following limits:

- A. ±0.5 PPM, when the radio is at 26.5°C (79.8°F).
- B. ±2 PPM at any other temperature within the range of -5°C to +55°C (+23°F to +131°F).
- C. The specification limit (±2 PPM or ±5 PPM) at any temperature within the ranges of -40°C to -5°C (-40°F to +23°F) or +55°C to +70°C (+131°F to +158°F).

If an adjustment is required, pry up the cover on the top of the ICOM to expose the trimmer, and use one of the following procedures:

If the radio is at an ambient temperature of 26.5°C (79.8°F), set the oscillator for the correct operating frequency.

If the radio is not at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

- A. To hold the setting error to ±0.6 PPM (which is considered reasonable for 5 PPM ICOMS):
 - 1. Maintain the radio at 26.5°C (±5°C) and set the oscillator to desired frequency, or-
 - 2. Maintain the radio at 26.5°C (±10°C) and offset the oscillator, as a function of actual temperature, by the amount shown in Figure 10.
- B. To hold setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMs): Maintain unit at 26.5°C (±5°C) and offset the oscillator as a function of actual temperature, by the amount shown in Figure 10.

For example: Assume the ambient temperature of the radio is 18.5°C (65.4°F). At that temperature, the curve shows a correction factor of 0.3 PPM. (At 406 MHz, 1 PPM is 406 Hz. At 512 MHz, 1 PPM is 512 Hz).

With an operating frequency of 450 MHz, set the oscillator for a reading of 135 Hz (0.3 x 450 Hz) higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 26.5°C), set the oscillator for the indicated PPM lower than the licensed operating frequency.

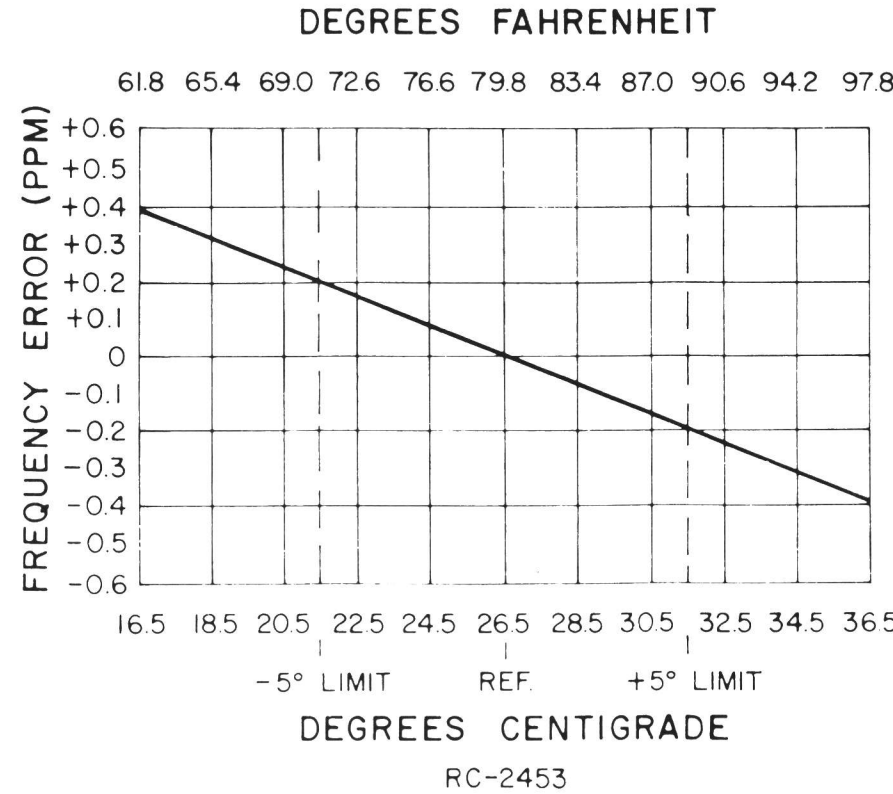
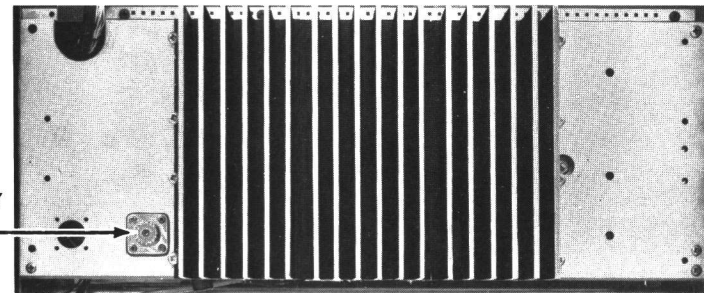
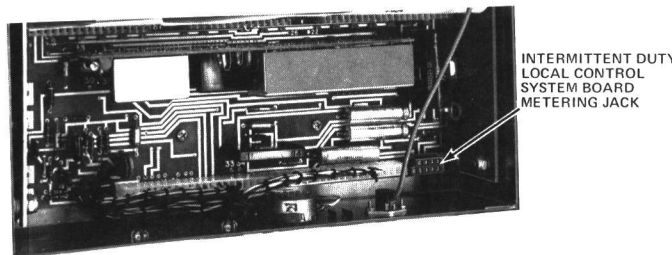
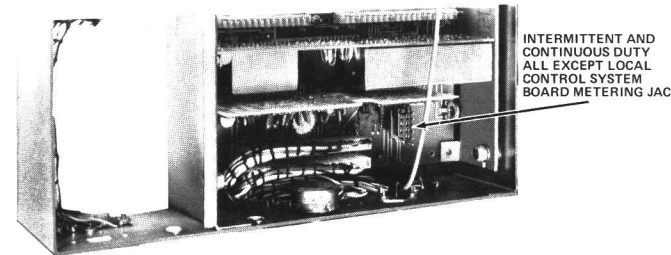
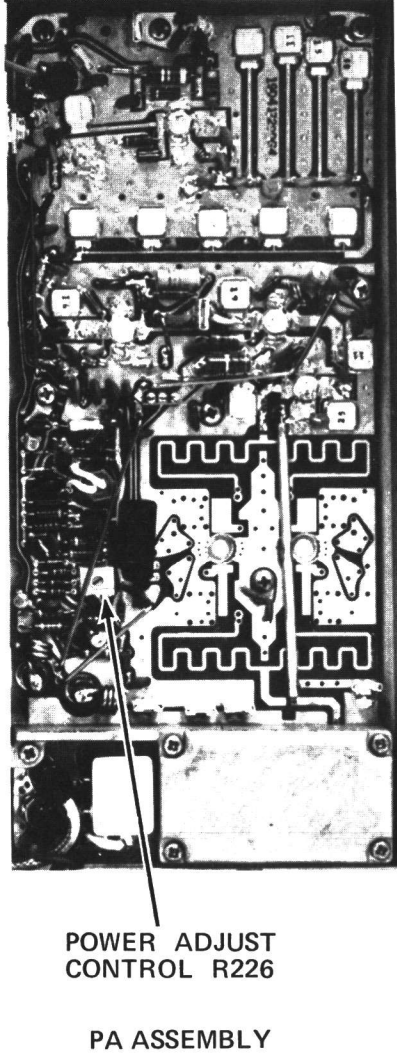
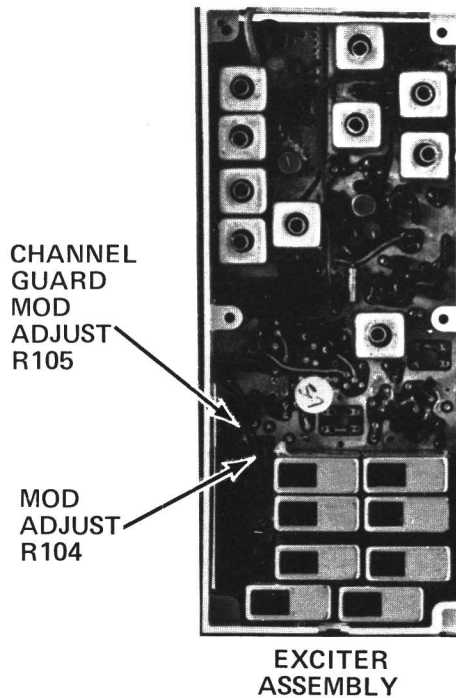


Figure 10 - Frequency Characteristics Vs. Temperature



CONTINUOUS DUTY PA ANTENNA JACK J243

INTERMITTENT DUTY PA ANTENNA JACK J201

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

- 1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
- 2. A 50-ohm wattmeter connected to antenna jack J201 or J243.
- 3. A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

- 1. Place ICOMs on Exciter Board (crystal frequency = operating frequency + 36).
- 2. For a large change in frequency or badly mis-aligned transmitter, pre-set the slugs in T104 and T105 to the bottom of the coil form. Pre-set all of the other slugs to the top of the coil form.

NOTE
Always tune T103 on the lowest transmitter frequency.

- 3. For multi-frequency transmitters with a frequency spacing less than 2.75 MHz for frequencies between 450-470 MHz, 2.90 MHz for frequencies between 470-494 MHz, or 3.0 MHz for frequencies between 494-512 MHz, tune the transmitter on the lowest frequency.
For multi-frequency transmitters with a frequency spacing greater than that specified above, tune the transmitter using a center frequency tune-up ICOM. These limits can be extended to 2.75 MHz, 2.90 MHz, and 3.00 MHz respectively with 1 dB degradation in power output.
- 4. Connect the red plug on the GE Test Set to the System Board metering jack, and the black plug to the Exciter metering jack. Set the polarity to +, and set the range to the Test 1 position (1-Volt position for 4EX8K12) for all adjustments. The voltage reading at position "F" with the HIGH SENSITIVITY button pressed may be converted to PA collector current by reading the current as 10 amperes full scale.
- 5. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
1.	B (MOD-1)	T103	See Procedure	Tune T103 for the maximum meter reading on the lowest frequency. After tuning T103 for maximum, turn the slot 1/8 of a turn clockwise (increasing inductance).
2.	C (MULT-1)	T104	Minimum	Tune T104 for a dip in meter reading.
3.	D (MULT-2)	T105, T104 & T106	See Procedure	Tune T105 for maximum meter reading and re-adjust T104 for maximum meter reading. Then tune T106 for a dip in meter reading.
4.	F (MULT-3)	T107, T106, T108 & T109	See Procedure	Tune T107 for maximum meter reading and re-adjust T106 for maximum meter reading. Then tune T108 for a dip in meter reading and T109 for maximum meter reading.
5.	G (AMPL-1)	T110, T108 & T109	Maximum	Tune T110 for maximum meter reading, and then re-adjust T108 and T109 for maximum meter reading.
6.	D (AMPL-1 DRIVE on PA)	T111 & T112	Maximum	Move the black metering plug to the Power Amplifier metering jack and tune T111 and then T112 for maximum meter reading. Then alternately tune T111 and T112 for maximum meter reading.
7.	G (AMPL-1)	T108, T109 & T110	Maximum	Move the black metering plug back to the exciter metering jack and re-adjust T108, T109 and T110 for maximum meter reading.
8.	D (AMPL-1 DRIVE on PA)	T111 & T112	Maximum	Move the black metering plug back to the Power Amplifier metering jack and re-adjust T111 and T112 for maximum meter reading.
9.		R226		Set Power Adjust potentiometer R226 on the PA board for the desired power output (from 6 to 20 Watts).
ADDITIONAL STEPS FOR TRANSMITTERS USING CENTER FREQUENCY TUNE-UP ICOM				
10.	D (MULT-2)	T105	See Procedure	Move the black metering plug to the exciter metering jack and re-adjust T105 for equal drive on the highest and lowest frequency.
11.	G (AMPL-1)	T110 & T108	Maximum	Re-adjust T110 and then T108 for maximum meter reading on the lowest frequency.

ALIGNMENT PROCEDURE

450—512 MHz, 20-WATT STATION TRANSMITTER
INTERMITTENT AND CONTINUOUS DUTY

TEST PROCEDURES

These Test Procedures are designed to assist you in servicing a transmitter that is operating-- but not properly. Problems encountered could be low power output, tone and voice deviation, defective audio sensitivity, and modulator adjust control set too high. Once a defect is pin-pointed,

refer to the "Service Check" and the additional corrective measures included in the Transmitter Troubleshooting Procedure. Before starting with the Transmitter Test Procedures, be sure the transmitter is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

for test hookup as shown:

1. Wattmeter similar to:
Bird # 43
Jones # 711N
2. VTVM similar to:
Triplet # 850
Heath # IM-21
3. Audio Generator similar to:
GE Model 4EX6A10
4. Deviation Meter (with a .75 kHz scale) similar to:
Measurements # 720
5. Multimeter similar to:
GE TEST SET MODEL 4EX3A11,
MODEL 4EX8K12 or
20,000 ohms-per-Volt voltmeter

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output from the antenna jack to the wattmeter through a 50-ohm coaxial cable. Make sure the wattmeter is terminated into a 50-ohm load.
2. Key the transmitter and check the wattmeter for the desired power output.

SERVICE CHECK

Check the setting of the Power Adjust Control (R226).

Refer to the QUICK CHECKS on the Transmitter Troubleshooting Procedure.

VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

1. Connect the test equipment to the transmitter as shown.
2. In radios with Channel Guard, set Channel Guard Mod Adjust R105 for zero tone deviation.
3. Set the audio generator frequency to 1 kHz.
 - A. In all station combinations except Local Control Intermittent Duty combinations, set the audio generator output to 30 millivolts RMS.
 - B. In Local Control Intermittent Duty station combinations, set the audio generator output to 1.0 volt RMS.
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ± 4.5 kHz in radios without Channel Guard, and ± 3.75 kHz in radios with Channel Guard.
6. If necessary, adjust MOD ADJUST control R104 for the proper deviation on plus (+) or minus (-) deviation, whichever is greater.

NOTES: MASTR II STATION transmitters are adjusted for 4.5 kHz deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz under the worst conditions of frequency, voltage and temperature.

7. If the deviation reading plus (+) or minus (-) differs by more than 0.5 kHz, recheck Steps 1 and 2 as shown in the Transmitter Alignment Chart.

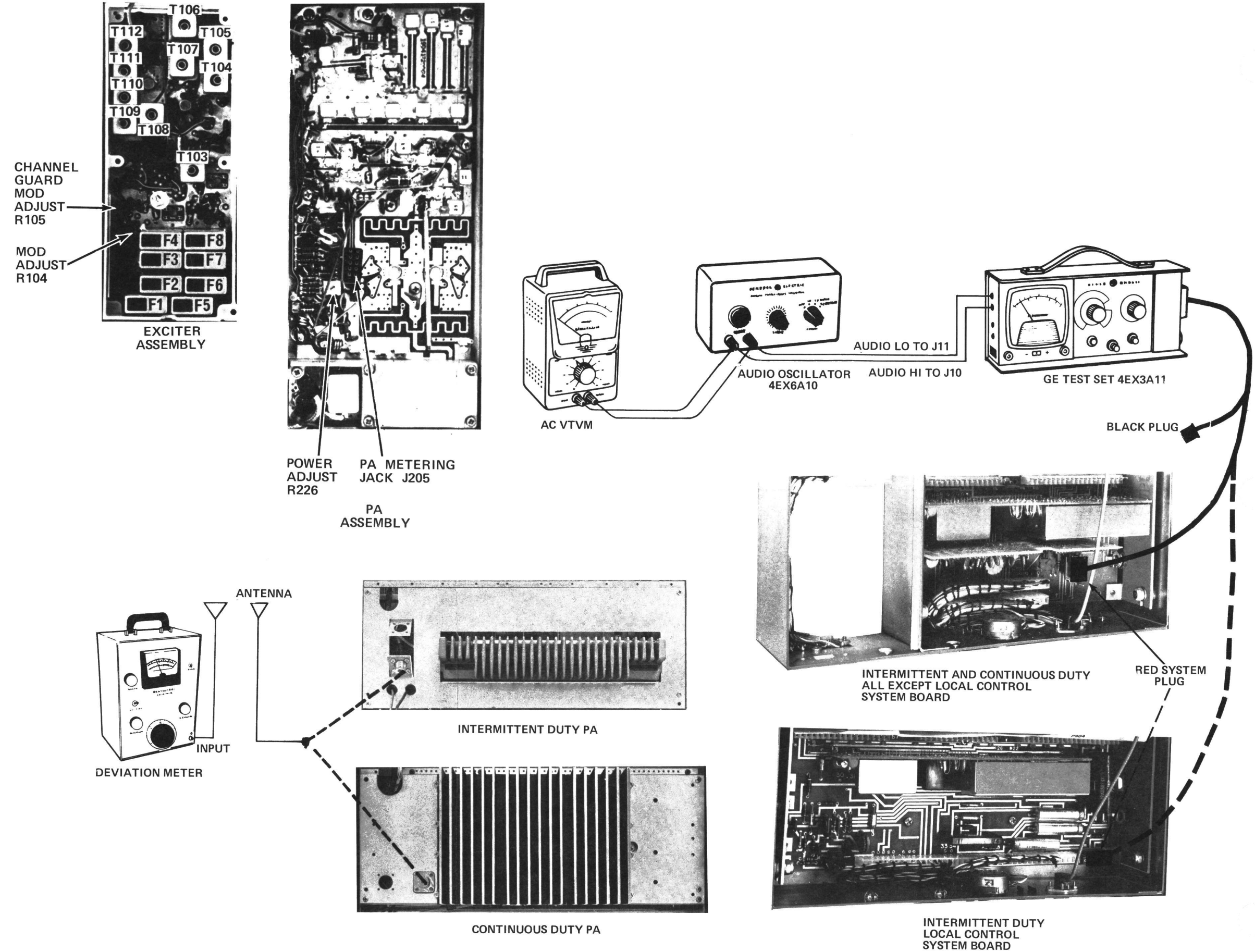
TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

1. Set up the Deviation Meter and monitor the output of the transmitter.
2. Remove the 1000 Hz signal from the audio generator.
3. Key the transmitter and check for 0.75 kHz deviation. If the reading is low or high, adjust Channel Guard MOD ADJUST R105 for a reading of 0.75 kHz.

NOTES:

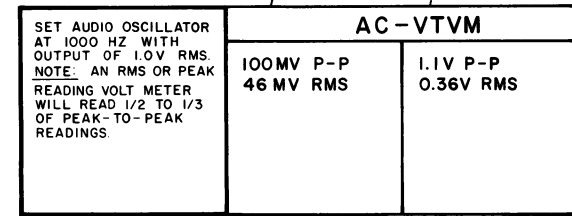
1. On units supplied with Channel Guard, the Phase Modulator Tuning should be adjusted carefully to insure proper performance. (Refer to Step 1 and 2 in the Transmitter Alignment Chart).
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

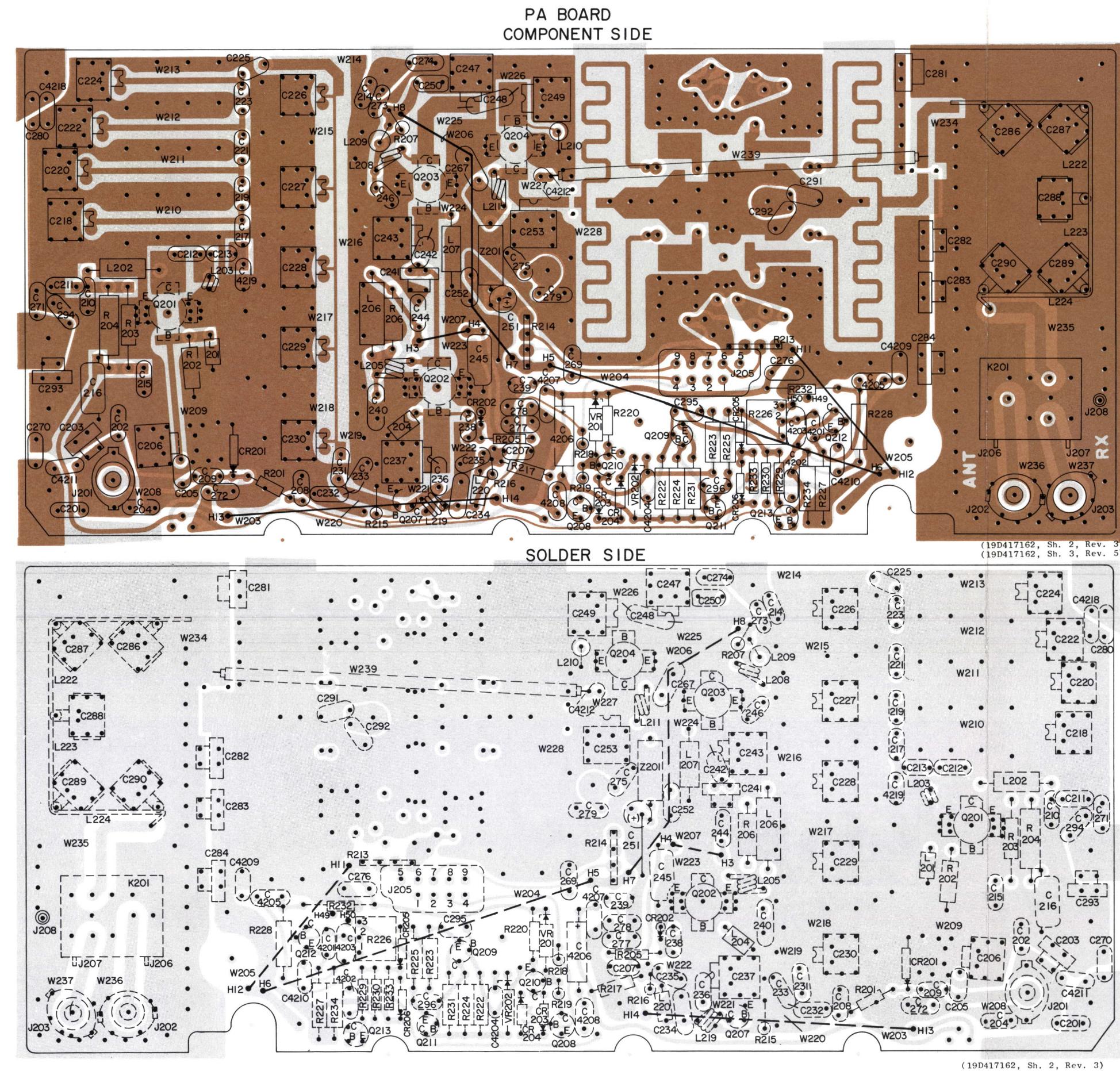
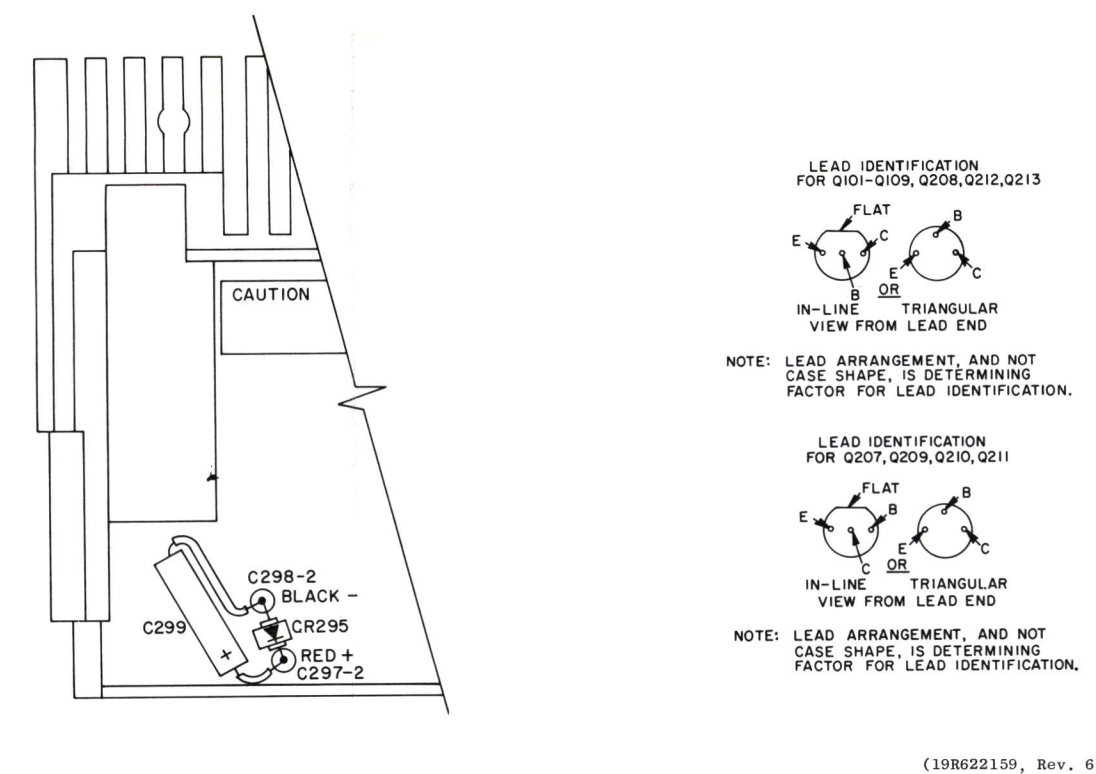
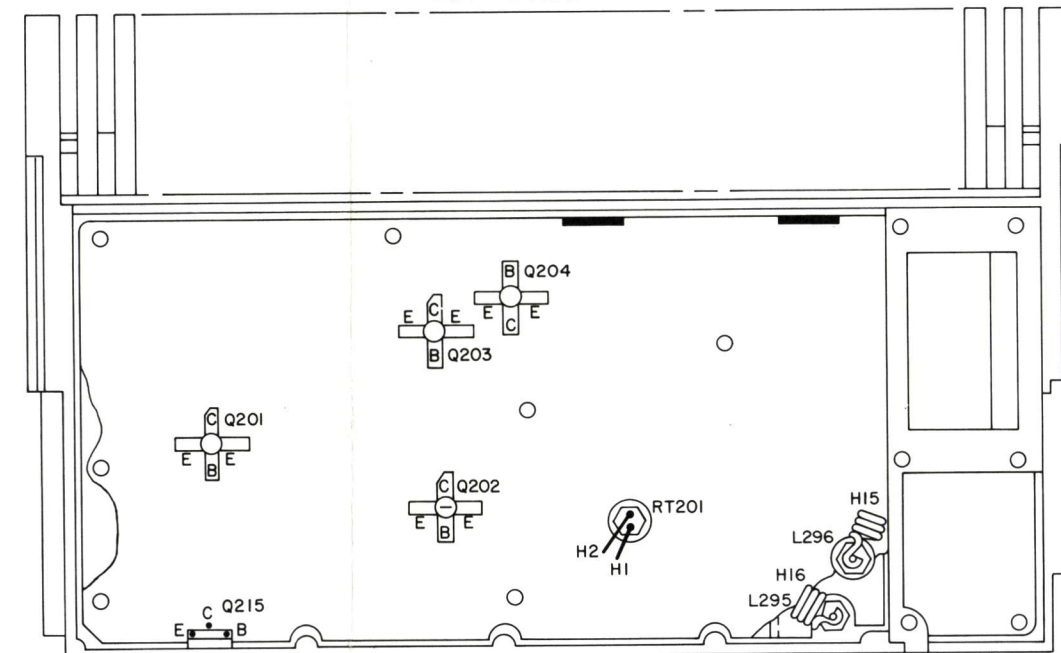
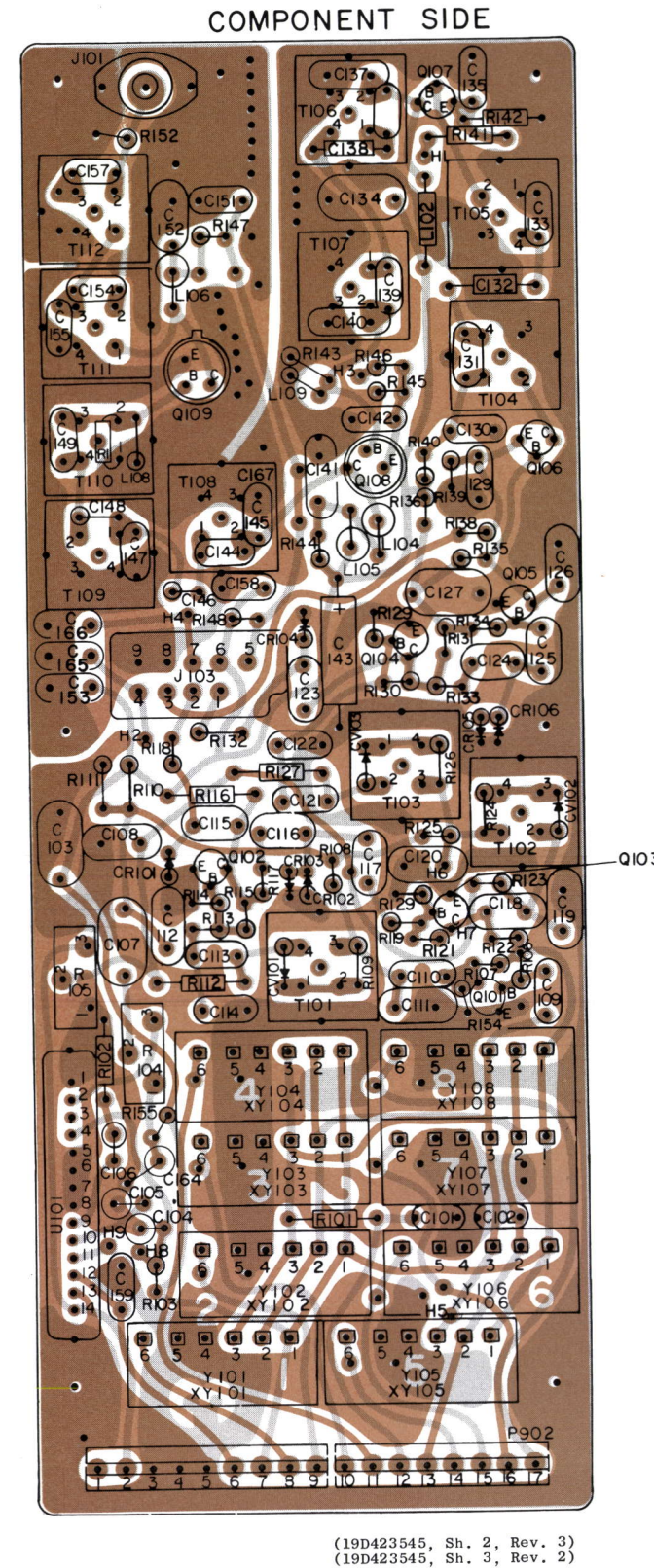


STEP I - QUICK CHECKS

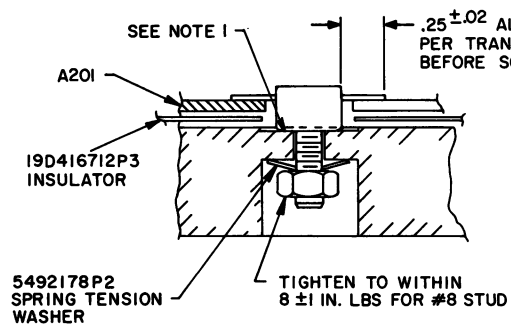
METER POSITION GE TEST SET	PROBABLE DEFECTIVE STAGE		
	HIGH METER READING	LOW METER READING	ZERO METER READING
EXCITER			
B (MOD-1)	Q102, 10-Volt Regulator	T103, CV103, C104	T103, CV103, CR104, Q104
C (MULT-1)	Q105, Q106, T104	Q105, Q106	Q105, Q106, T104
D (MULT-2)	Q107, T106	T104, T104, Q107	T104, T105, Q107, T106
F (MULT-3)	Q108, T108	T106, T107, Q108	T106, T107, Q108, T108
G (AMPL-1)	Q109, C157	T108, T109, T110, Q109	T108, T109, T110, Q109, L106
POWER AMPLIFIER			
"C" (TRIPLER DRIVE)		Low Output from Exciter	No output from Exciter CR201
"D" (AMPL-2 INPUT)	Q207	Q207	Q207, Q201
"F" (PA CURRENT)	Q204	Q204, Low Output from Q201, Q207, Q202, Q203	Q203, Q202, Q207 Pos. C & D

STEP 3
CHECK AUDIO AC VOLTAGES
EQUIPMENT REQUIRED
● AUDIO OSCILLATOR
● AC VTVM

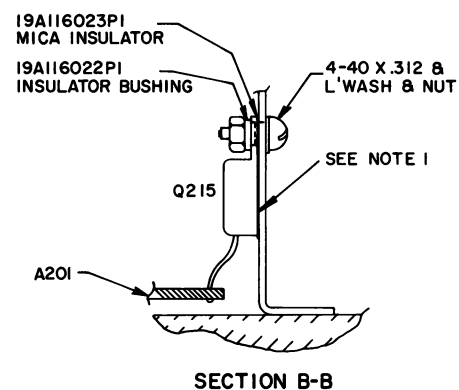




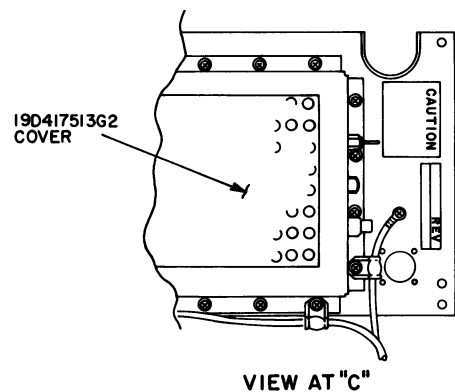
Issue 2



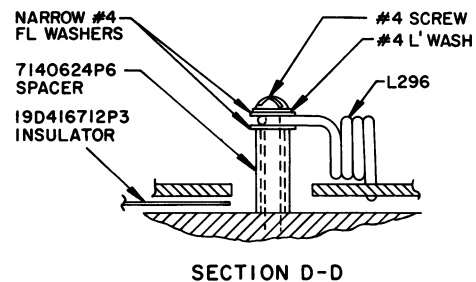
SECTION A-A
TYP MTG FOR
Q201 THRU Q204



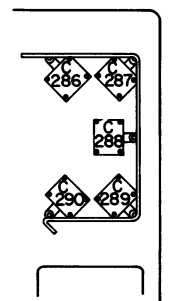
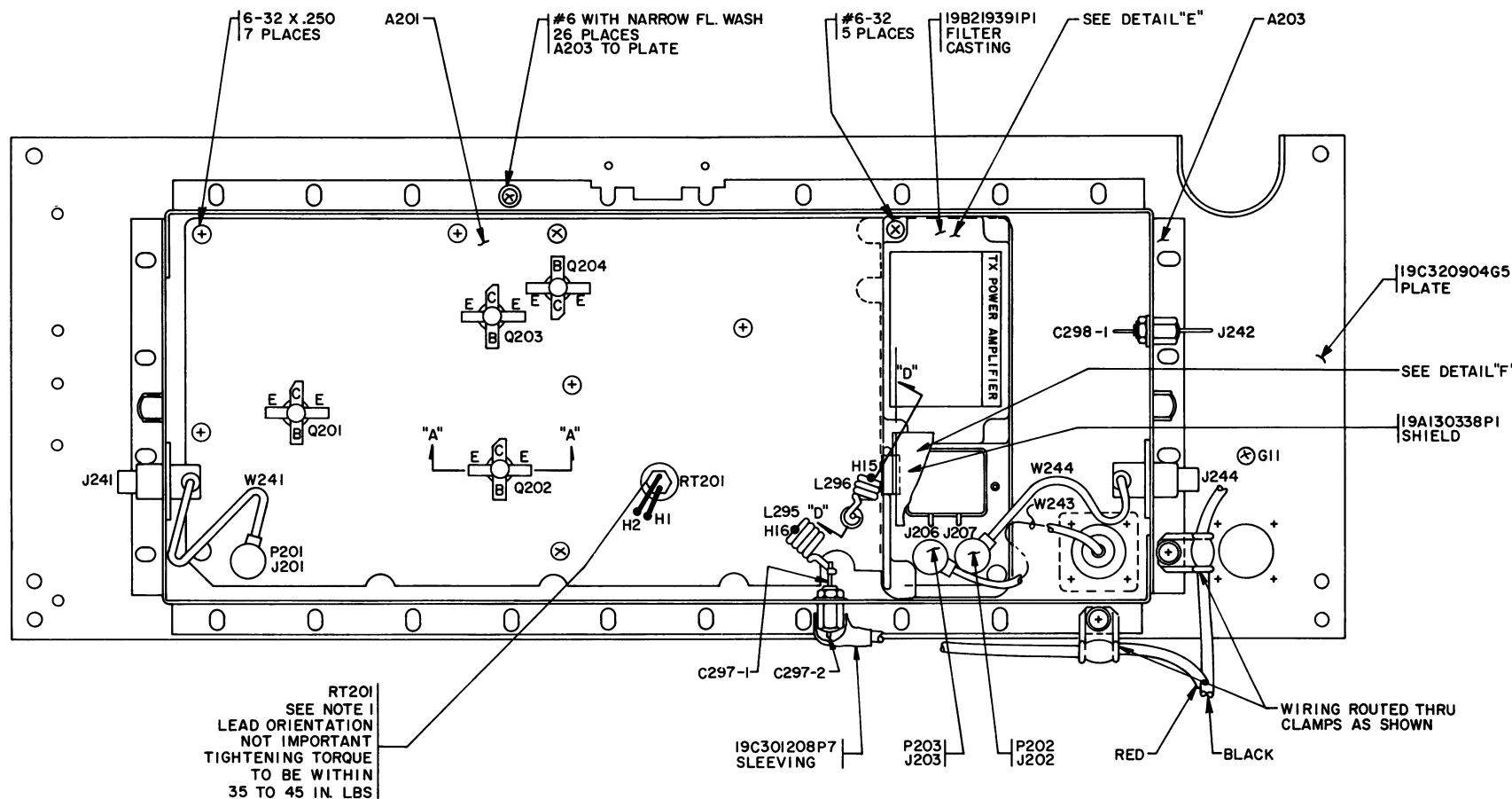
SECTION B-B



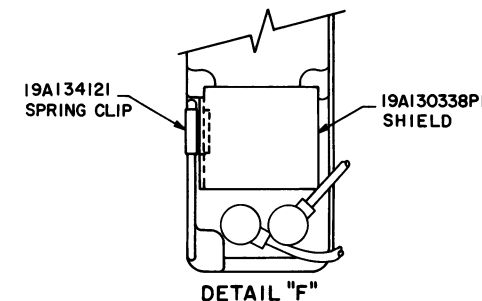
VIEW AT "C"



SECTION D-D

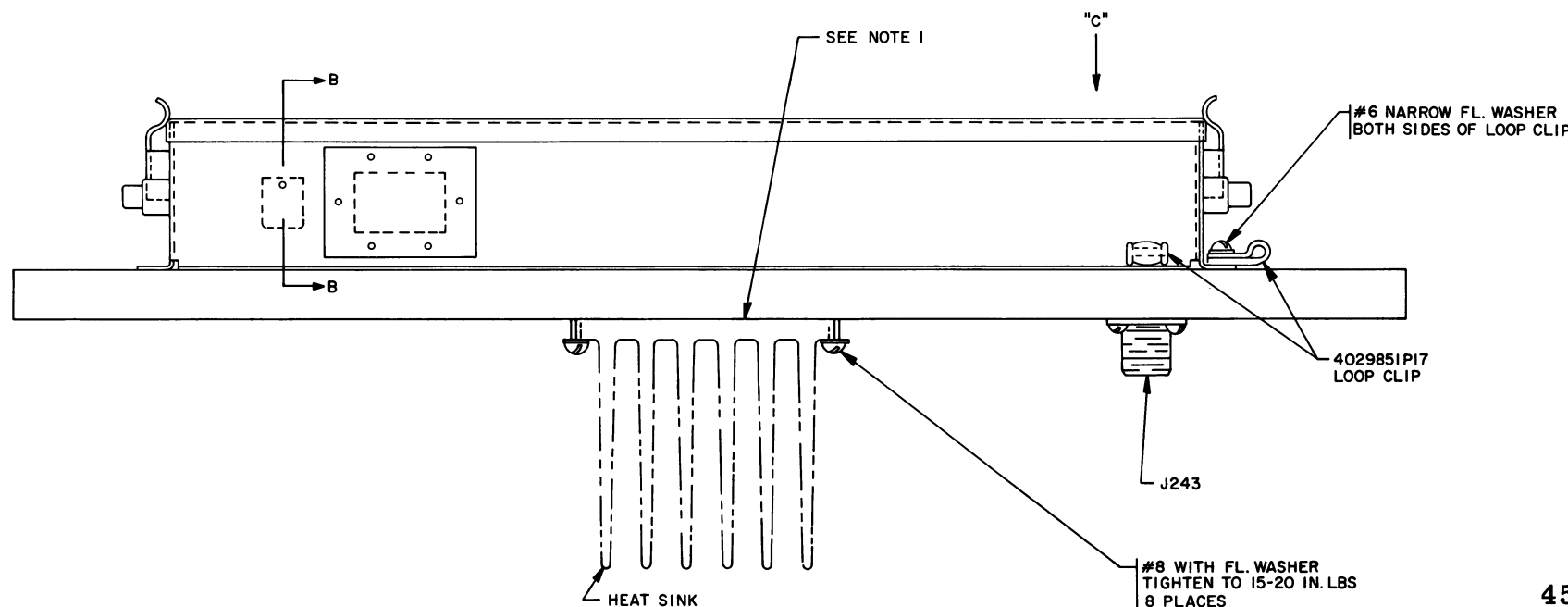


DETAIL "E"
(VIEW OF A201 WITH
COVER REMOVED)



DETAIL "F"

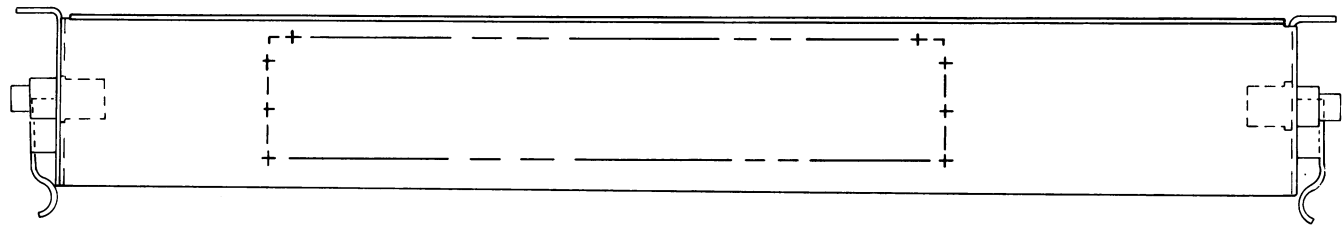
NOTES:
1. APPLY SILICONE GREASE TO BOTH
SIDES OF MICA INSULATOR TO
MOUNTING SURFACE OF Q201 THRU
Q204 & RT201 AND UNPAINTED FLAT
SURFACE OF HEAT SINK.
NO GREASE ALLOWED ON THE
THREADED PORTION OF THE MTG
STUD.



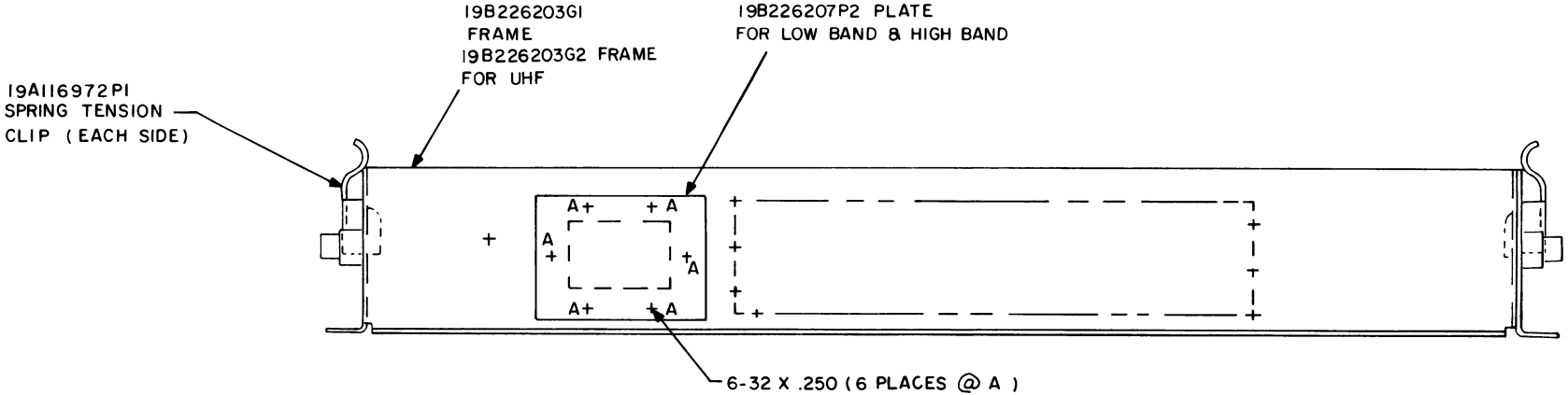
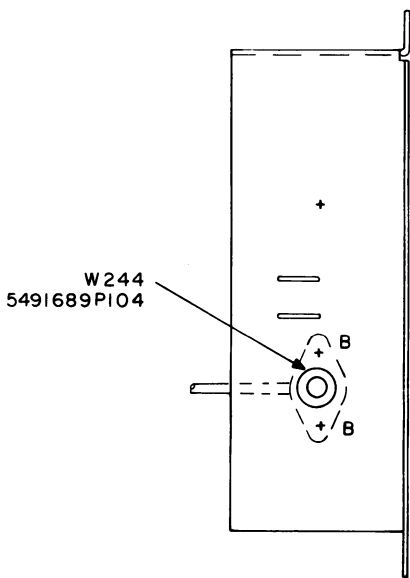
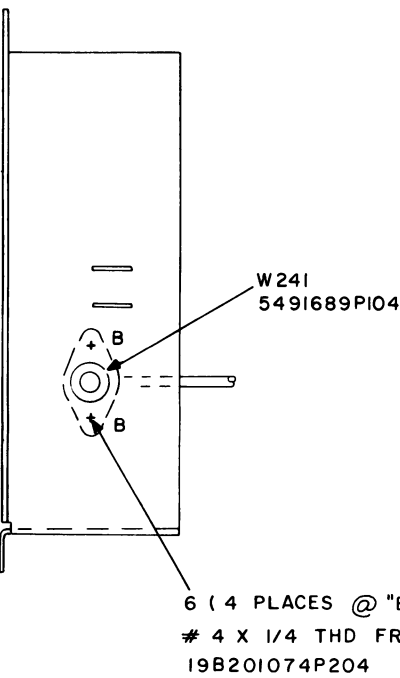
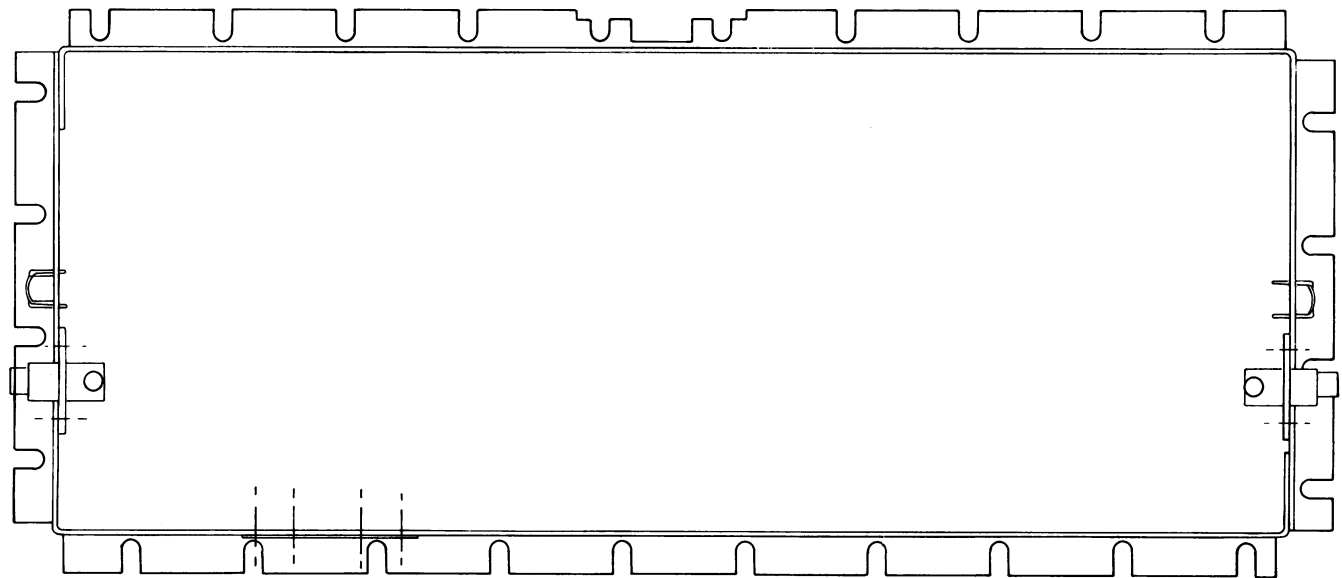
OUTLINE DIAGRAM

450—512 MHz, 20-WATT STATION
TRANSMITTER CONTINUOUS DUTY

(19D423081, Rev. 0)



A203



OUTLINE DIAGRAM

FRAME ASSEMBLY FOR INTERMITTENT &
CONTINUOUS DUTY TRANSMITTERS

PARTS LIST			SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION	SYMBOL	GE PART NO.	DESCRIPTION
LEI-4609C														
406-420 MHz, 450-512 MHz EXCITER BOARD 19D416859G5-G8														
SYMBOL	GE PART NO.	DESCRIPTION												
		19D416859G5 2 FREQ 406-420 MHz (L) 19D416859G6 2 FREQ 450-512 MHz (H) 19D416859G7 8 FREQ 406-420 MHz (L) 19D416859G8 8 FREQ 450-512 MHz (H)												
		----- CAPACITORS -----												
C101 and C102	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.	C137H*	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5 and G7 by REV A.	C161L*	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5, G7 by REV C.	R101	3R152P561K	----- RESISTORS ----- Composition: 560 ohms ±10%, 1/4 w.	R155*	3R152P201J	Composition: 200 ohms ±5%, 1/4 w. Added to G5, G7 by REV F. Added to G6, G8 by REV E.
C103	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.	C138	5491601P115	Phenolic: 0.56 pf ±5%, 500 VDCW.	C161H*	5496219P242	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G6, G8 by REV B.	R102*	3R152P431J	Composition: 430 ohms ±5%, 1/4 w.	T103	19D416843G1	Coil. Includes:
C104	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.	C139L	5496219P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.	C162L*	5496219P238	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM. Added to G5, G7 by REV C.					5493185P12	Tuning slug.
C105	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.	C139H	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.	C162H*	5496219P235	Ceramic disc: 4.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM. Added to G6, G8 by REV B.	R103*	3R152P391K 3R152P201J	Composition: 390 ohms ±10%, 1/4 w. Composition: 200 ohms ±5%, 1/4 w.	T104	19D416843G3	Coil. Includes:
C106	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.	C141	5490008P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.	C163*	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added to G5, G7 by REV D. Added to G6, G8 by REV C.		3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.	T105	19D416843G2	Tuning slug.
C107	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.	C142	7489162P25	Silver mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.	C164*	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Added to G5, G7 by REV F. Added to G6, G8 by REV E.	R104	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.	T106 and T107	19D416843G7	Coil. Includes:
C108	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C144L*	5496219P243	Ceramic disc: 13 pf ±15%, 500 VDCW, temp coef -80 PPM.			----- DIODES AND RECTIFIERS -----	R105*	19B209358P105	Variable, carbon film: approx 200 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201.	T108 and T109	5493185P12	Tuning slug.
C109*	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW. Deleted in G5, G7 by REV D; G6, G8 by REV A.		5496219P244	In G5 and G7 earlier than REV A:	CR104 thru CR106	19A115250P1	Silicon.		19B209358P108	Variable, carbon film: approx 2000 to 50,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.		19D416843G5	Coil. Includes:
	5494481P111	In G5, G7 of REV B and earlier: In G6, G8 of REV A and earlier:	C144H	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.	CV103*	5495769P9	Silicon, capacitive: 33 pf ±20%, at 4 VDC. Added to G5 and G7 by REV E.	R106*	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.	T110	5493185P13	Tuning slug.
	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C145*	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM. Deleted in G5 and G7 by REV A.		5495769P8	Silicon, capacitive: 33 pf ±20%, at 4 VDC. Deleted in G5-G8 by REV A.		3R152P393K	Composition: 39,000 ohms ±10%, 1/4 w.			COIL ASSEMBLY 19D416843G8
C110	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C145L*	5496219P252	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5 and G7 by REV A.	CV103L*	5495769P9	Silicon, capacitive: 33 pf ±20%, at 4 VDC. Added to G5, G7 by REV A. Deleted from G5, G7 by REV E.	R107*	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.	R1	3R152P151K	Composition: 150 ohms ±10%, 1/4 w.
C112	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C145H*	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5 and G7 by REV A.	CV103H*	5495769P8	Silicon, capacitive: 33 pf ±20%, at 4 VDC. Added to G6, G8 by REV A. Deleted from G6, G8 by REV D.		3R152P331K	Composition: 330 ohms ±10%, 1/4 w.		5493185P13	Tuning slug.
C118	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.	C146*	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW. Deleted in G5 and G7 by REV A.			----- JACKS AND RECEPTACLES -----	R110	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.	T111	19D416843G4	Coil. Includes:
C123 thru C125	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C146L*	5491601P109	Phenolic: 0.33 pf ±5%, 500 VDCW. Added to G5 and G7 by REV A.	J101	19A130924G1	Receptacle, coaxial: sim to Cinch 14H11613.	R111	3R152P474K	Composition: 0.47 megohm ±10%, 1/4 w.		5493185P12	Tuning slug.
C126	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.	C146H*	5491601P113	Phenolic: 0.47 pf ±5%, 500 VDCW. Added to G5 and G7 by REV A.	J103	19B219374G1	Connector. Includes:	R125	3R152P102K	Composition: 101000 ohms ±10%, 1/4 w.	T112	19D416843G6	Coil. Includes:
C127	19A116080P107	Polyester: 10 µf ±10%, 50 VDCW.	C147L	5496219P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.		19A116651P1	Contacts. (9).	R126	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.		5493185P12	Tuning slug.
C129 and C130	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	C147H	5496219P236	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.			----- INDUCTORS -----	R127	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.			----- INTEGRATED CIRCUITS -----
C131L	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.	C148	5491601P111	Phenolic: 0.39 pf ±5%, 500 VDCW.	L102	19B209420P130	Coil, RF: 27.0 µh ±10%, 3.60 ohms DC res max; sim to Jeffers 441316-5.	R128	3R152P683K	Composition: 69,000 ohms ±10%, 1/4 w.	U101	19D416542G1	Audio Transmitter.
C131H	5496219P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.	C149L	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.	L104	7488079P7	Choke, RF: 1.50 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4411-10K.	R129	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.			----- SOCKETS -----
C132	5491601P118	Phenolic: 0.75 pf ±5%, 500 VDCW.	C149H	5496219P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.	L105	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.	R130	3R152P562K	Composition: 5600 ohms ±10%, 1/4 w.	XY101 thru XY108	19A116779P1	Socket. Part of Mechanical Construction. Includes:
C133L	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.	C150	5496372P365	Ceramic disc: 470 pf ±10%, 500 VDCW, temp coef -4700 PPM.	L106	7488079P5	Choke, RF: 0.68 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4411-5K.	R134	3R152P223K	Composition: 22,000 ohms ±10%, 1/4 w.			----- OSCILLATORS -----
C133H	5496219P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.	C151	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	L108 and L109	19B209420P123	Coil, RF: 6.80 µh ±10%, 1.80 ohms DC res max; sim to Jeffers 4446-2.	R135	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.			NOTE: When reordering specify ICOM Frequency. ICOM Freq = $\frac{\text{Operating Frequency}}{36}$
C134	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.	C152	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.			----- PLUGS -----	R136	3R152P470K	Composition: 47 ohms ±10%, 1/4 w.			
C135	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.	C153	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.			Includes:	R138	3R152P473K	Composition: 47,000 ohms ±10%, 1/4 w.	Y101 thru Y108	19A129393G18	Externally compensated, ±5 PPM, 406-512 MHz.
C136*	5496219P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5 and G7 by REV A.	C154L	5496219P238	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.		19B219594P2 19B219594P3	Contact strip: 8 pins. Contact strip: 9 pins.	R139	3R152P181K	Composition: 180 ohms ±10%, 1/4 w.		19A129393G15	Externally compensated, ±2 PPM, 406-512 MHz.
C136L*	5496219P348	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -150 PPM. Deleted from G5 and G7 by REV A.	C154H	5496219P236	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.			----- TRANSISTORS -----	R140	3R152P271K	Composition: 270 ohms ±10%, 1/4 w.			MECHANICAL PARTS
C136H*	5496219P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM. Deleted from G5 and G7 by REV A.	C155L*	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM. Deleted in G5, G7 by REV C.	Q101*	19A115330P1	Silicon, NPN.	R141	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.		19A129424G2	Can. (Used with T103-T112).
C137*	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM. Deleted from G5 and G7 by REV A.	C155H*	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM. Deleted in G6, G8 by REV B.		19A115330P1	In G5, G7 of REV A and earlier: In G6, G8 of REV B and earlier:	R142	3R152P620J	Composition: 62 ohms ±5%, 1/4 w.	Y101 thru Y108	4036555P1	Insulator, washer: nylon. (Used with Q108, Q110).
C137L*	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM. Added to G5 and G7 by REV A.	C156	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.	Q104 thru Q106	19A115910P1	Silicon, NPN; sim to Type 2N3904.	R143	3R152P331K	Composition: 330 ohms ±10%, 1/4 w.			
			C157L*	5496219P238	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM. Deleted in G5, G7 by REV C.	Q107	19A115328P1	Silicon, NPN.	R144	3R152P181K	Composition: 180 ohms ±10%, 1/4 w.			
			C157H*	5496219P236	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.	Q108	19A115329P2	Silicon, NPN.	R145	3R152P390K	Composition: 39 ohms ±10%, 1/4 w.			
			C158	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	Q109*	19A115329P2	Silicon, NPN. Deleted in G5, G7 by REV C. Deleted in G6, G8 by REV B.	R146	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.			
			C159*	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.		19A116868P1	Silicon, NPN; sim to Type 2N4427. Added to G5, G7 by REV C. Added to G6, G8 by REV B.	R148	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.			
				19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.	Q110*			R149*	3R152P240J	Composition: 24 ohms ±5%, 1/2 w.			

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. C - 19D416859G5 & G7

REV. B - 19D416859G6 & G8
Incorporated into initial shipment.

REV. D - To improve modulator limiting. Deleted C109 and added C 163.

REV. E - To improve operation. Changed CV101, CV102, CV103, C159 and R105.

REV. F - To reduce alternator noise and to improve operation. Changed R107 and added R155, R154 and C164.

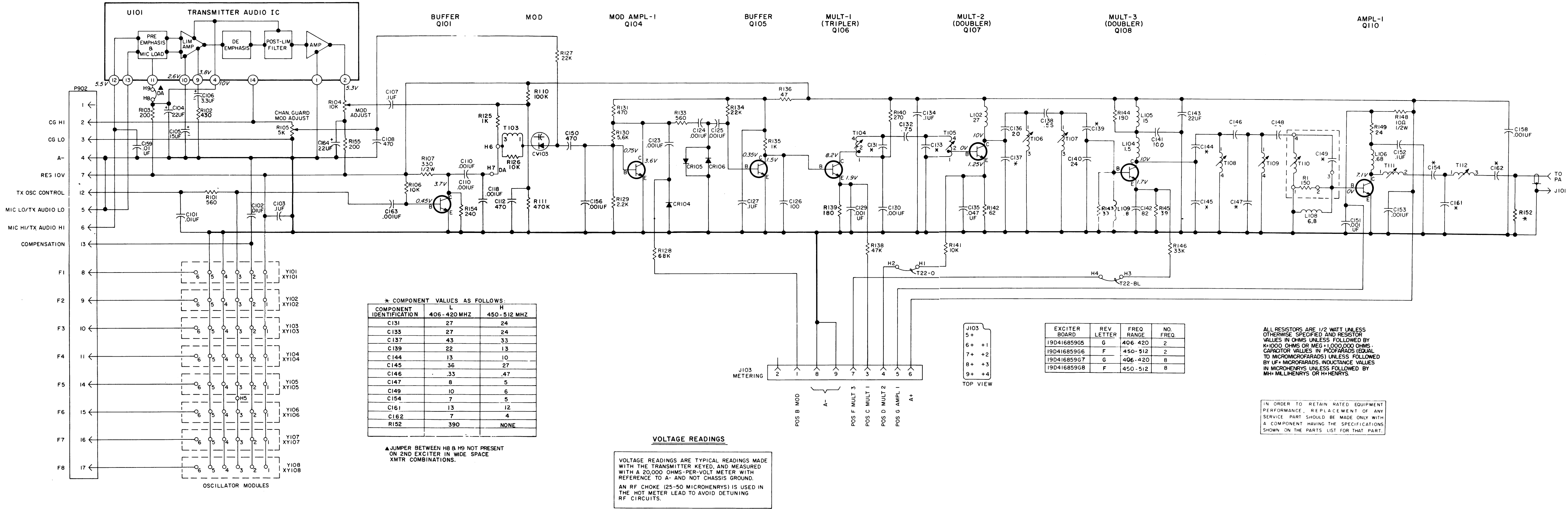
REV. G - To increase audio sensitivity. Changed R102.

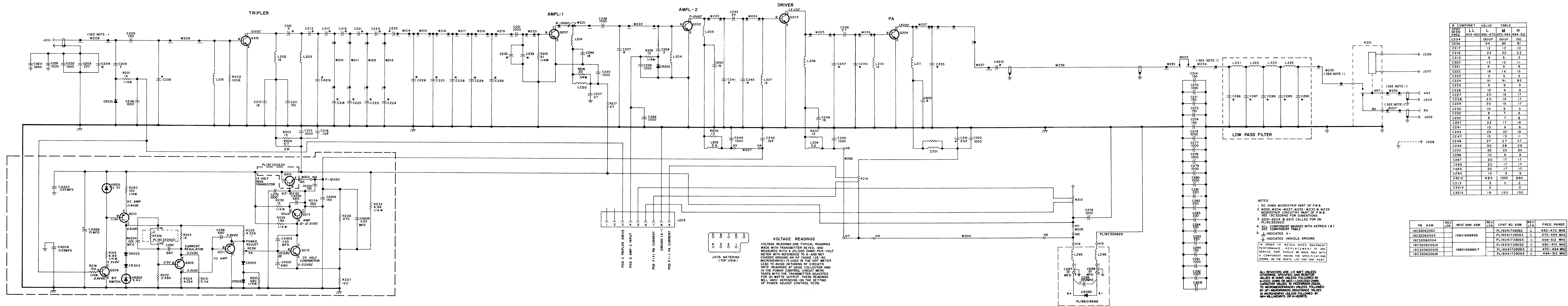
REV. C - To improve modulator limiting. Deleted C109 and added C163.

REV. D - To improve operation. Changed CV101, CV102, CV103, C159 and R105.

REV. E - To reduce alternator noise and improve operation. Changed R107 and added R154, R155 and C164.

REV. F - To increase audio sensitivity. Changed R102.





(19R622000, Rev. 5)

SCHEMATIC DIAGRAM

450—512 MHz, 20-WATT STATION POWER AMPLIFIER
19C320620G2-G4 & G14-G16 INTERMITTENT DUTY

PARTS LIST		
LBI-4857A		
450-512 MHz, 20 WATT POWER AMPLIFIER		
19C320620G2 450-470 MHz 19C320620G3 470-494 MHz 19C320620G4 494-512 MHz 19C320620G14 450-470 MHz 19C320620G15 470-494 MHz 19C320620G16 494-512 MHz		
SYMBOL	GE PART NO.	DESCRIPTION
L295 and L296	19A129562P2	Coil.
Q201	19A129283P1	Silicon, NPN.
Q202	19A116953P1	Silicon, NPN.
Q203	19A116953P2	Silicon, NPN.
Q204	19A129283P4	Silicon, NPN.
Q215	19A116742P1	Silicon, NPN.
RT201	19A129379G1	Thermistor.
COMPONENT BOARD		
19D417290G2 450-470 MHz (L) 19D417290G3 470-494 MHz (M) 19D417290G4 494-512 MHz (H)		
CAPACITORS		
C201 and C202	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C203	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C204* and C204M*	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C204*	19A116655P8	In REV B and earlier: Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C204H	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C205	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C206L	19A116952P94	Silver mica: 94 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C206M	19A116952P85	Silver mica: 85 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C206H	19A116952P81	Silver mica: 81 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C207	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C208	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C209	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C210	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C211	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C212	19A116656P3J0	Ceramic disc: 3 pf ±.5 pf, 500 VDCW, temp coef 0 PPM.
C213L	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C213M	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C213H	5491238P12	Ceramic disc: 2 pf ±0.25 pf, 500 VDCW, temp coef -80 ±120 PPM.
C214	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C215	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.

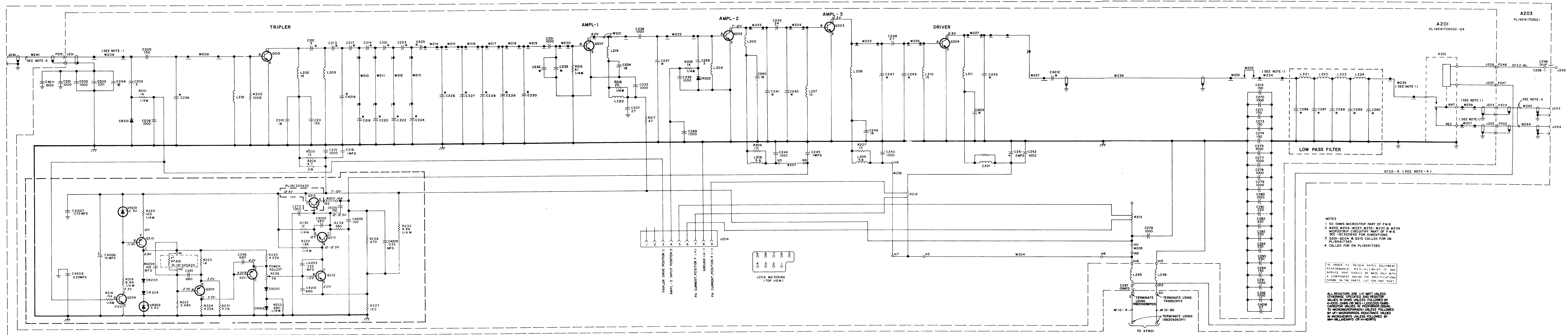
SYMBOL	GE PART NO.	DESCRIPTION
C216*	19A116966P107	Metallized polyester: .1 µf ±10%, 50 VDCW. Earlier than REV A:
5496267P13		Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C217L	19A116656P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C217M	19A116656P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C217H	19A116656P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C218L	19A116952P22	Metallized teflon: 22 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C218M	19A116952P22	Metallized teflon: 22 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C218H	19A116952P22	Metallized teflon: 22 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C219L	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C219M	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C219H	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C220L	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C220M	19A116952P12	Metallized teflon: 12 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C220H	19A116952P11	Metallized teflon: 11 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C221L	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C221M	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C221H	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C222L	19A116952P18	Metallized teflon: 18 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C222M	19A116952P16	Metallized teflon: 16 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C222H	19A116952P15	Metallized teflon: 15 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C223L	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C223M	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C223H	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C224L	19A116952P91	Silver mica: 91 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C224M	19A116952P91	Silver mica: 91 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C224H	19A116952P85	Silver mica: 85 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C225L	19A116656P9J0	Ceramic disc: 9 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C225M	19A116656P9J0	Ceramic disc: 9 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C225H	19A116656P9J0	Ceramic disc: 9 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C226L	19A116952P10	Metallized teflon: 10 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C226M	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C226H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227L	19A116952P19	Metallized teflon: 19 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227M	19A116952P19	Metallized teflon: 19 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.

SYMBOL	GE PART NO.	DESCRIPTION
C228L	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C228M	19A116952P19	Metallized teflon: 19 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C228H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229L	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229M	19A116952P19	Metallized teflon: 19 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230L	19A116952P10	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230M	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C231	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C232L	19A116656P8J0	Ceramic disc: 8 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C232M	19A116656P7J0	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C232H	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C233L	19A116656P8J0	Ceramic disc: 8 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C233M	19A116656P7J0	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C233H	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C234	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C235 and C236	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C237L	19A116952P22	Metallized teflon: 22 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C237M	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C237H	19A116952P16	Metallized teflon: 16 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C238	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C239	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C240	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C241L	19A116679P10D	Metallized teflon: 10 pf ±.5 pf, 250 VDCW.
C241M	19A116679P9D	Metallized teflon: 9 pf ±.5 pf, 250 VDCW.
C241H	19A116679P8D	Metallized teflon: 8 pf ±.5 pf, 250 VDCW.
C242	19A116656P24J0	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C243L	19A116952P25	Metallized teflon: 25 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C243M	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C243H	19A116952P19	Metallized teflon: 19 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C244	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C245*	19A116966P107	Metallized polyester: .1 µf ±10%, 50 VDCW. Earlier than REV A:
5496267P13		Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C246	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C247L	19A116952P15	Metallized teflon: 15 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.

SYMBOL	GE PART NO.	DESCRIPTION
C247M	19A116952P13	Metallized teflon: 13 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C247H	19A116952P11	Metallized teflon: 11 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C248L	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C248M	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C248H	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C249L	19A116952P30	Metallized teflon: 30 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C249M	19A116952P28	Metallized teflon: 28 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C249H	19A116952P25	Metallized teflon: 25 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C250	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C251*	19A116680P1	Electrolytic: 2 µf ±150% -10%, 25 VDCW; sim to Mallory Type TX.
5496267P13		Earlier than REV A: Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C252	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C253L	19A116952P23	Metallized teflon: 23 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C253M	19A116952P22	Metallized teflon: 22 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C253H	19A116952P20	Metallized teflon: 20 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C269 and C270	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C271	19A116655P8	Ceramic disc: 120 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C272	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C273 and C274	19A116655P8	Ceramic disc: 120 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C275 thru C280	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C281 thru C284	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C286L	19A116952P10	Metallized teflon: 10 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C286M	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C286H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287L	19A116952P20	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287M	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288L	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288M	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289L	19A116952P20	Metallized teflon: 20 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289M	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289H	19A116952P17	Metallized teflon: 17 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C290L	19A116952P10	Metallized teflon: 10 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.

SYMBOL	GE PART NO.	DESCRIPTION
C290M	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C290H	19A116952P9	Metallized teflon: 9 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C291 and C292	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C293	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C294	19A116655P8	Ceramic disc: 8 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C295 and C296	5494481P9	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4201 and C4202	5494481P9	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4203	19A116080P104	Polyester: 0.033 µf ±10%, 50 VDCW.
C4204	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4205	19A116080P104	Polyester: 0.033 µf ±10%, 50 VDCW.
C4206	5496267P14	Tantalum: 15 pf ±20%, 20 VDCW; sim to Sprague Type 150D.
C4207 and C4208	19A116080P104	Polyester: 0.033 µf ±10%, 50 VDCW.
C4209 and C4210	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4211	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4212L	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4212M	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4212H	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4213L	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C4213M	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4213H	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4218	19A116656P27J8	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4219L	5491238P12	Ceramic disc: 2 pf ±0.25 pf, 500 VDCW, temp coef -80 ±120 PPM.
C4219H	5491238P12	Ceramic disc: 2 pf ±0.25 pf, 500 VDCW, temp coef -80 ±120 PPM.
DIODES AND RECTIFIERS		
CR201*	19A116052P2	Silicon. In REV A and earlier:
	19A115250P1	Silicon.
	19A115250P1	Silicon.
CR202 thru CR206	19A130924G1	Connector, receptacle; sim to Cinch 14H11613.
J201 thru J203	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J208		
K201	19A116722P1	Hermetic sealed: 125 ohms ±20%, 1 form C contact, 9.6 to 15.8 VDC (over the temp range indicated).
L201	19A129773G1	Coil.
L202	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.

SYMBOL	GE PART NO.	DESCRIPTION
L203L	19A129233P2	Coil.
L203M	19A129233P3	Coil.
L203H	19A129233P3	Coil.
L204	19A129773G1	Coil.
L205L	19B219457P6	Coil.
L205M	19B219457P6	Coil.
L205H	19B219457P6	Coil.
L206	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L207	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L208	19B219457P6	Coil.
L209	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L210	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L211	19B219457P6	Coil.
L219L	19A129774P1	Coil.
L219M	19A129774P1	Coil.
L219H	19A129774P1	Coil.
L220	19A129773G1	Coil.
L221 thru L224	19C320623P1	Jumper.
Q207	19A116201P1	Silicon.
Q208	19A129184P1	Silicon, NPN.
Q209 thru Q211	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q212	19A129184P1	Silicon, NPN.
Q213	19A129187P1	Silicon, PNP.
RESISTORS		
R201	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R202	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R203	3R77P150J	Composition: 15 ohms ±5%, 1/2 w.
R204	19B209022P131	Wirewound: 4.7 ohms ±10



* COMPONENT	VALUE	TABLE
CPNT	LL	L
RES	M	M
FREQ	403-420	470-494
C204	000UF	000UF
C206	94	85
C217	12	12
C218	22	22
C219	6	6
C220	13	12
C221	6	6
C222	18	16
C223	5	5
C224	91	91
C225	9	9
C226	10	9
C227	20	19
C228	20	19
C229	20	19
C230	10	9
C232	8	7
C233	8	7
C237	22	17
C241	10	9
C243	25	20
C247	15	13
C248	27	27
C249	30	28
C253	23	22
C266	10	9
C267	20	19
C268	20	19
C269	20	19
C270	10	9
C271	10	9
C272	10	9
C273	10	9
C274	10	9
C275	10	9
C276	10	9
C277	10	9
C278	10	9
C279	10	9
C280	10	9
C281	10	9
C282	10	9
C283	10	9
C284	10	9
C285	10	9
C286	10	9
C287	10	9
C288	10	9
C289	10	9
C290	10	9
C4212	680	1000
C213	3	3
C4219	2	2
C4213	18	150

P.A. ASM.	REV.	CPNT. BD.	REV.	FREQ.
PL19D417383G2		PL19D417383G2	C	450-470
PL19D417383G3		PL19D417383G3	C	470-494
PL19D417383G4		PL19D417383G4	C	494-512

(19R622064, Rev. 6)

SCHEMATIC DIAGRAM

450—512 MHz STATION POWER AMPLIFIER
19D417383G2-G4 CONTINUOUS DUTY

PARTS LIST		
LBI-4942A		
450-512 MHz, 20 WATT CONTINUOUS DUTY POWER AMPLIFIER		
19D417383G2 450-470 MHz		
19D417383G3 470-494 MHz		
19D417383G4 494-512 MHz		

SYMBOL	GE PART NO.	DESCRIPTION
A201	COMPONENT BOARD A201L 19D417290G2 450-470 MHz A201M 19D417290G3 470-494 MHz A201H 19D417290G4 494-512 MHz	
	----- CAPACITORS -----	
C201 and C202	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C203	19A116679P220K	Mica: 220 pf $\pm 10\%$, 250 VDCW.
C204L* and C204M*	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap. In REV B and earlier:
C204*	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C204H	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C205	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C206L	19A116952P94	Silver mica: 94 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C206M	19A116952P85	Silver mica: 85 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C206H	19A116952P81	Silver mica: 81 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C207	5496218P249	Ceramic disc: 27 pf $\pm 5\%$, 500 VDCW, temp coef -80 PPM.
C208	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C209	19A116656P3J0	Ceramic disc: 3 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C210	7489162P9	Silver mica: 18 pf $\pm 5\%$, 500 VDCW; sim to Electro Motive Type DM-15.
C211	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C212	19A116656P3J0	Ceramic disc: 3 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C213L	19A116656P3J0	Ceramic disc: 3 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C213M	19A116656P3J0	Ceramic disc: 3 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C213H	5491238P12	Ceramic disc: 2 pf ± 0.25 pf, 500 VDCW, temp coef -80 ± 20 PPM.
C214	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C215	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C216*	19A116966P107	Metallized polyester: .1 μ f $\pm 10\%$, 50 VDCW. Earlier than REV A:
5496267P13		Tantalum: 2.2 μ f $\pm 20\%$, 20 VDCW; sim to Sprague Type 150D.
C217L	19A116656P12J0	Ceramic disc: 12 pf $\pm 5\%$, 500 VDCW, temp coef 0 PPM.
C217M	19A116656P12J0	Ceramic disc: 12 pf $\pm 5\%$, 500 VDCW, temp coef 0 PPM.
C217H	19A116656P12J0	Ceramic disc: 12 pf $\pm 5\%$, 500 VDCW, temp coef 0 PPM.
C218L	19A116952P22	Metallized teflon: 22 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C218M	19A116952P22	Metallized teflon: 22 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C218H	19A116952P22	Metallized teflon: 22 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C219L	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C219M	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C219H	19A116656P3J0	Ceramic disc: 5 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C220L	19A116952P13	Metallized teflon: 13 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C220M	19A116952P12	Metallized teflon: 2 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C220H	19A116952P11	Metallized teflon: 11 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C221L	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C221M	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C221H	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C222L	19A116952P18	Metallized teflon: 18 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C222M	19A116952P16	Metallized teflon: 16 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C222H	19A116952P15	Metallized teflon: 15 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C223L	19A116656P3J0	Ceramic disc: 5 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C223M	19A116656P3J0	Ceramic disc: 5 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C223H	19A116656P3J0	Ceramic disc: 5 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C224L	19A116952P91	Silver mica: 91 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C224M	19A116952P91	Silver mica: 91 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C224H	19A116952P85	Silver mica: 85 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C225L	19A116656P3J0	Ceramic disc: 9 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C225M	19A116656P3J0	Ceramic disc: 9 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C225H	19A116656P3J0	Ceramic disc: 9 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C226L	19A116952P10	Metallized teflon: 10 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C226M	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C226H	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227M	19A116952P19	Metallized teflon: 19 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C227H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C228L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C228M	19A116952P19	Metallized teflon: 19 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C228H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229M	19A116952P19	Metallized teflon: 19 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C229H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230L	19A116952P10	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230M	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C230H	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C231	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C232L	19A116656P3J0	Ceramic disc: 8 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C232M	19A116656P3J0	Ceramic disc: 7 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C232H	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C233L	19A116656P3J0	Ceramic disc: 8 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C233M	19A116656P7J0	Ceramic disc: 7 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C233H	19A116656P3J0	Ceramic disc: 6 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C234	7489162P9	Silver mica: 18 pf $\pm 5\%$, 500 VDCW; sim to Electro Motive Type DM-15.
C235 and C236	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C237L	19A116952P22	Metallized teflon: 22 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C237M	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C237H	19A116952P16	Metallized teflon: 16 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C238	19A116656P3J0	Ceramic disc: 3 pf ± 0.5 pf, 500 VDCW, temp coef 0 PPM.
C239	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C240	7489162P9	Silver mica: 18 pf $\pm 5\%$, 500 VDCW; sim to Electro Motive Type DM-15.
C241L	19A116679P10D	Metallized teflon: 10 pf ± 0.5 pf, 250 VDCW.
C241M	19A116679P9D	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW.
C241H	19A116679P8D	Metallized teflon: 8 pf ± 0.5 pf, 250 VDCW.
C242	19A116656P24J0	Ceramic disc: 24 pf $\pm 5\%$, 500 VDCW, temp coef 0 PPM.
C243L	19A116952P25	Metallized teflon: 25 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C243M	19A116952P19	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C243H	19A116952P19	Metallized teflon: 19 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C244	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C245*	19A116966P107	Metallized polyester: .1 μ f $\pm 10\%$, 50 VDCW. Earlier than REV A:
5496267P13		Tantalum: 2.2 μ f $\pm 20\%$, 20 VDCW; sim to Sprague Type 150D.
C246	7489162P9	Silver mica: 18 pf $\pm 5\%$, 500 VDCW; sim to Electro Motive Type DM-15.
C247L	19A116952P15	Metallized teflon: 15 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C247M	19A116952P13	Metallized teflon: 13 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C247H	19A116952P11	Metallized teflon: 11 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C248L	5496218P249	Ceramic disc: 27 pf $\pm 5\%$, 500 VDCW, temp coef -80 PPM.
C248M	5496218P249	Ceramic disc: 27 pf $\pm 5\%$, 500 VDCW, temp coef -80 PPM.
C248H	5496218P249	Ceramic disc: 27 pf $\pm 5\%$, 500 VDCW, temp coef -80 PPM.
C249L	19A116952P30	Metallized teflon: 30 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C249M	19A116952P28	Metallized teflon: 28 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C249H	19A116952P25	Metallized teflon: 25 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C250	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C251*	19A116680P1	Electrolytic: 2 μ f $\pm 100\%$ -10% , 25 VDCW; sim to Mallory Type TTX.
5496267P13		Earlier than REV A:
C252	19A116655P20	Tantalum: 2.2 μ f $\pm 20\%$, 20 VDCW; sim to Sprague Type 150D.
C253L	19A116952P23	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C253M	19A116952P22	Metallized teflon: 22 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.

SYMBOL	GE PART NO.	DESCRIPTION
C253H	19A116952P20	Metallized teflon: 20 pf $\pm 2\%$, 250 VDCW; sim to Underwood Type J1HF.
C269 and C270	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C271	19A116655P8	Ceramic disc: 120 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C272	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C273 and C274	19A116655P8	Ceramic disc: 120 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C275 thru C280	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C281 thru C284	19A116679P220K	Mica: 220 pf $\pm 10\%$, 250 VDCW.
C286L	19A116952P10	Metallized teflon: 10 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C286M	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C286H	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287M	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C287H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288M	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C288H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289L	19A116952P20	Metallized teflon: 20 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289M	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C289H	19A116952P17	Metallized teflon: 17 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C290L	19A116952P10	Metallized teflon: 10 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C290M	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C290H	19A116952P9	Metallized teflon: 9 pf ± 0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C291 and C292	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C293	19A116679P220K	Mica: 220 pf $\pm 10\%$, 250 VDCW.
C294	19A116655P8	Ceramic disc: 9 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C295 and C296	5494481P9	Ceramic disc: 680 pf $\pm 20\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4202	5494481P9	Ceramic disc: 680 pf $\pm 20\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4203	19A116080P104	Polyester: 0.033 μ f $\pm 10\%$, 50 VDCW.
C4204	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4205	19A116080P104	Polyester: 0.033 μ f $\pm 10\%$, 50 VDCW.
C4206	5496267P14	Tantalum: 15 μ f $\pm 20\%$, 20 VDCW; sim to Sprague Type 150D.
C4207 and C4208	19A116080P104	Polyester: 0.033 μ f $\pm 10\%$, 50 VDCW.
C4209 and C4210	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4211	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4212L	19A116655P18	Ceramic disc: 680 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4212M	19A116655P20	Ceramic disc: 1000 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
C4212H	19A116655P18	Ceramic disc: 680 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4213L	7489162P9	Silver mica: 18 pf $\pm 5\%$, 500 VDCW; sim to Electro Motive Type DM-15.
C4213M	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4213H	19A116655P8	Ceramic disc: 150 pf $\pm 10\%$, 1000 VDCW; sim to RMC Type JF Discap.
C4218	19A116656P27J8	Ceramic disc: 27 pf $\pm 5\%$, 500 VDCW, temp coef -80 PPM.
C4219L	5491238P12	Ceramic disc: 2 pf ± 0.25 pf, 500 VDCW, temp coef -80 ± 20 PPM.
C4219H	5491238P12	Ceramic disc: 2 pf ± 0.25 pf, 500 VDCW, temp coef -80 ± 20 PPM.
- - - - - DIODES AND RECTIFIERS - - - - -		
CR201*	19A116052P2	Silicon. In REV A and earlier:
	19A115250P1	Silicon.
CR202 thru CR206	19A115250P1	Silicon.
- - - - - JACKS AND RECEPTACLES - - - - -		
J201 thru J203	19A130924G1	Connector, receptacle: sim to Cinch 14H11613.
J208	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
- - - - - RELAYS - - - - -		
K201	19A116722P1	Hermetic sealed: 125 ohms $\pm 20\%$, 1 form C contact, 9.6 to 15.8 VDC (over the temp range indicated).
- - - - - INDUCTORS - - - - -		
L201	19A129773G1	Coil.
L202	7488079P18	Choke, RF: 15.0 μ h $\pm 10\%$, 1.20 ohms DC res max; sim to Jeffers 4421-9.
L203L	19A129233P2	Coil.
L203M	19A129233P3	Coil.
L203H	19A129233P3	Coil.
L204	19A129773G1	Coil.
L205L	19B219457P6	Coil.
L205M	19B219457P6	Coil.
L205H	19B219457P6	Coil.
L206	7488079P40	Choke, RF: 5.60 μ h $\pm 10\%$, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L207	7488079P18	Choke, RF: 15.0 μ h $\pm 10\%$, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L208	19B219457P6	Coil.
L209	7488079P40	Choke, RF: 5.60 μ h $\pm 10\%$, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L210	7488079P18	Choke, RF: 15.0 μ h $\pm 10\%$, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L211	19B219457P6	Coil.
L219L	19A129774P1	Coil.
L219M	19A129774P1	Coil.
L219H	19A129774P1	Coil.
L220	19A129773G1	Coil.
L221 thru L224	19C320623P1	Jumper.
- - - - - TRANSISTORS - - - - -		
Q207	19A116201P1	Silicon.
Q208	19A129184P1	Silicon, NPN.

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

