

DESCRIPTION AND MAINTENANCE

406—420 & 450—512 MHz, 100 WATT MASTR EXECUTIVE II TRANSMITTER

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DESCRIPTION

100 Watt MASTR Executive II transmitters are crystal controlled, phase modulated transmitters designed for one through four frequency operation in the 406-512 MHz frequency 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 final, power control and low pass filter assembly
- Multi-frequency board; used in multi-frequency radios (common to transmitter and receiver).

Figure 1 is a block diagram of the MASTR Executive II transmitter, showing the exciter, multi-frequency board and Power Amplifier Assembly.

The exciter contains the oscillator, audio IC, modulator and multipliers to provide 200 milliwatts of modulated RF power to the power amplifier. In vehicles with a positive ground, a polarity converter is used to power the exciter.

The Power Amplifier Assembly includes a Power Amplifier Driver module with power control, a Power Amplifier module and a Low Pass Filter/Antenna Switch module. The combination of Power Amplifier Driver and Power Amplifier modules provide up to 100 Watts of output power adjusted by the power adjust circuitry.

MAINTENANCE

The PA assembly is DC isolated from vehicle ground to permit operation in positive or negative ground vehicles.

NOTE

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause one of the in-line fuses to blow.

DISASSEMBLY

- To service the transmitter, remove the two retaining screws from the front cap assembly and pull radio out of case assembly.
- To remove exciter board:
 - (1) Unplug the exciter/PA cable and multi-frequency cable W2601 (when present).
 - (2) Remove the six screws holding the exciter board to the mounting frame and gently lift exciter board out of radio.
- To remove the PA assembly:
 - (1) Remove the PA top cover and unplug the exciter/PA cable, the antenna, receiver and PTT cables.

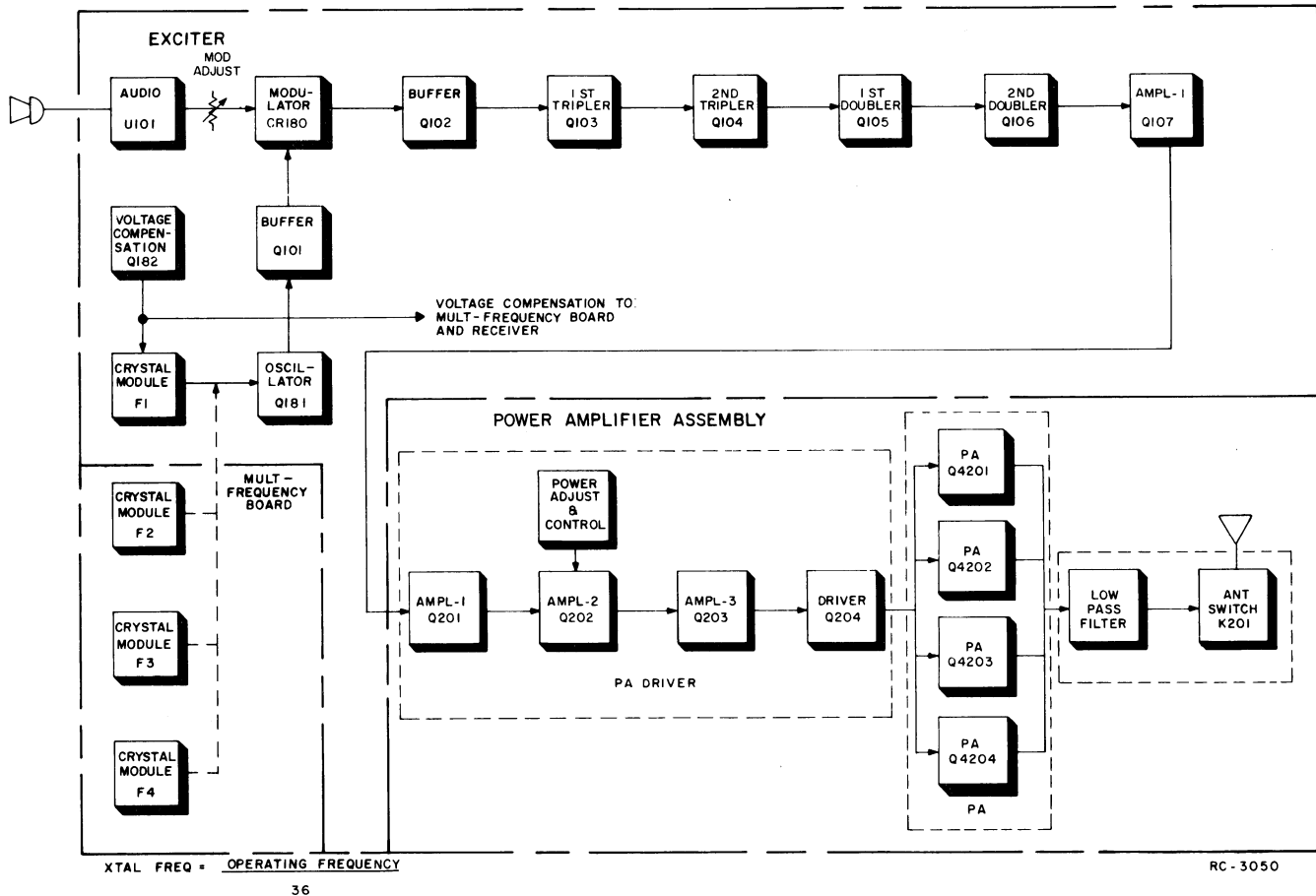


Figure 1 - Transmitter Block Diagram

- (2) Remove the four side-rail screws, and unsolder the power cables from the bottom of the PA assembly if desired.
- To remove PA Driver module (See PA assembly Outline Diagram):
 - (1) Remove the PA top cover and unplug the Exciter/PA cable.
 - (2) Unsolder power feed cables W212 from E202, W214 from G211 and W215 from E201.
- (3) Carefully unsolder and remove strap W211 between the PA Driver module and the PA module. Remove the excess solder from the ground connections with a de-soldering tool such as a SOLDA-PULLT®; then lift the connections from the PA Driver module with a scribe or X-acto knife®.
- (4) Unsolder thermistor (RT201) leads.
- (5) Remove Q215 retaining screw, nut and washer from heat sink assembly.
- (6) Remove Q202 transistor hold-down nut and spring washer on the bottom of the PA assembly.
- (7) Remove Q203 and Q204 transistor mounting screws (2 each), and nuts and washers on bottom of the PA assembly.
- (8) Remove the five PA Driver board mounting screws, and lift the board out.
- To remove PA module (See PA assembly Outline Diagram):

CAUTION

Extreme care must be taken to prevent damage to the printed circuit runs on the teflon splitter board of the PA module when removing strap W211.

- (1) Remove PA top cover.
- (2) Unsolder power feed cables W212 from E4201 and W213 from G4211.

CAUTION

Extreme care must be taken to prevent damage to the printed circuit runs on the teflon boards of the PA module and the Low Pass Filter module when removing straps W211 and W216.

- (3) Carefully unsolder and remove strap W211 between the PA Driver module and the PA module. Remove the excess solder from the ground connections with a de-soldering tool such as a SOLDA-PULLT®; then lift the connections from the PA Driver module with a scribe or X-acto® knife.
- (4) Carefully unsolder and remove strap W216 between the PA module and the Low Pass Filter module.
- (5) Remove Q4201 through Q4204 transistor mounting screws (2 each), and nuts and washers on bottom of the PA assembly.
- (6) Remove the seven PA board mounting screws, and lift the board out.

- To remove Low Pass Filter/Antenna Switch module:

- (1) Remove the PA top cover.
- (2) Remove antenna and receiver plugs, and disconnect PTT cables.

CAUTION

Extreme care must be taken to prevent damage to the printed circuit runs on the teflon boards of the PA module and the Low Pass Filter module when removing strap W216.

- (3) Carefully unsolder and remove strap W216 between the PA module and the Low Pass Filter module.
- (4) Remove the eight mounting screws, lift off the filter casting, and lift the board out.

PA TRANSISTOR REPLACEMENT

WARNING

The 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 remove PA RF transistor Q202:

- (1) With a 50-Watt soldering iron and a de-soldering tool such as a SOLDA-PULLT®, remove the excess solder from the transistor leads. Use a scribe or X-acto® knife to hold the leads away from the printed circuit board until the solder cools.
- (2) Turn the PA Assembly over.
- (3) Hold the body of the transistor to prevent it from turning. Remove the transistor hold-down nut and

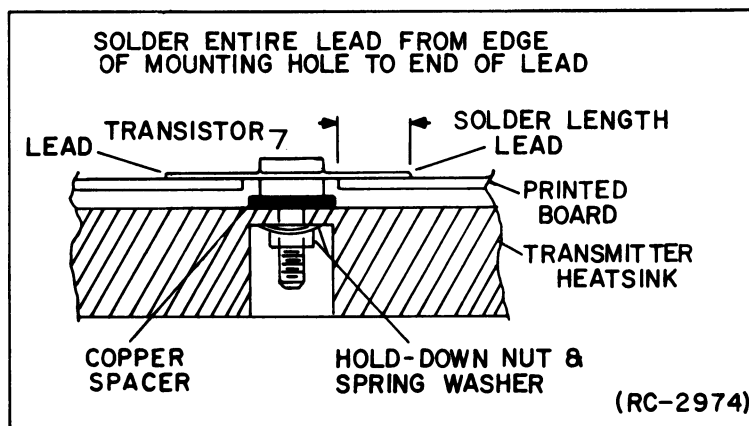
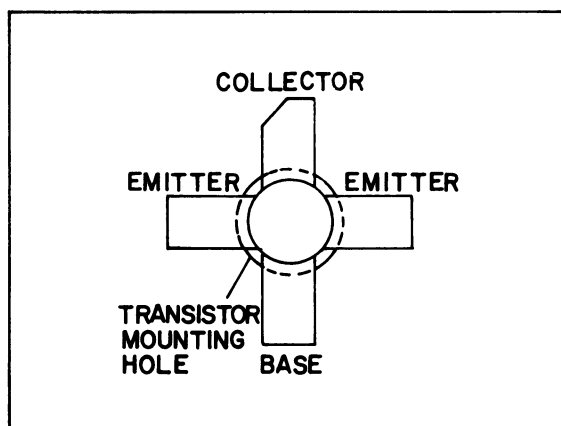


Figure 2 - Q202 Lead Identification and Mounting

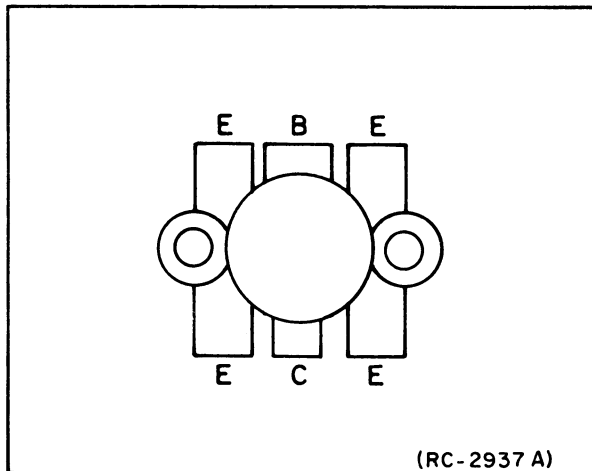


Figure 3 - Q203, Q204, and Q4201-Q4204
LEAD IDENTIFICATION

spring washer through the hole in the heatsink with an 11/32-inch nut-driver for Q202. Lift out the transistor, and remove 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 because part of the matching network is included in the base and collector runs. Do not misalign the copper spacer located between the transistor body and the heatsink.

● To remove RF PA transistors Q203, Q204, Q4201-Q4204 (Flange Type):

- (1) With a 50-Watt soldering iron and a de-soldering tool such as the SOLDA-PULLT®, remove the excess solder from the leads. Use a scribe or X-acto® knife to hold the leads away from the printed circuit board until the solder cools.
- (2) Turn the PA Assembly over.
- (3) Hold the nuts on the bottom of the heatsink with a 3/16-inch nut-driver and remove the two retaining screws. Lift out the transistor and remove 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 because part of the matching network is included in the base and collector runs.

● To replace RF PA transistors:

- (1) Trim the new transistor leads (if required) to the lead length of the removed transistor. Cut the collector lead of Q202 at a 45° angle for future identification (see Figure 2). The collector lead of Q203, Q204, and Q4201 through Q4204 is identified by the smaller center lead (see Figure 3). The letter "C" on top of each transistor also identifies the collector.
- (2) Apply a coat of silicon grease around the transistor mounting surface Q202, Q203, Q204, and Q4201-Q4204. Be sure the copper spacer for Q202 is properly aligned on the heat sink and place the transistor in the mounting hole. Align the leads as shown on the PA Assembly Outline Diagram. Then hold the body of the transistor and replace the hold-down nut and spring-washer (Q202) or the two retaining screws Q203, Q204, and Q4201-Q4204 using moderate torque, 8 inch-pounds for Q202 or 6 inch-pounds for Q203, Q204, & Q4201-Q4204. A torque wrench must be used for this adjustment since transistor damage can result if too little or too much torque is used.
- (3) 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. Do not use excessive heat which causes the printed wire runs to lift up from the board. Check for shorts and solder bridges with an ohmmeter 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.

TROUBLESHOOTING

A Troubleshooting Procedure, including QUICK CHECKS, permits rapid fault location in the exciter and power amplifier assembly.

MODULATION LEVEL 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 overmodulation 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. Connect the audio oscillator and the meter across audio input terminals J10 (Green-Hi) and J11 (Black-Lo) on GE Test Set, or across P902-4 (Mike High) through a 0.5 microfarad (or larger) DC blocking capacitor, and P902-5 (Mike Low) on the Exciter board.
2. Adjust the audio oscillator for 1-Volt RMS at 1000 Hz.
3. For transmitters without Channel Guard, set MOD ADJUST R104 for a 415 kHz swing using the deviation polarity that provides the highest reading on the frequency modulation monitor.
4. For transmitters with Channel Guard, set Channel Guard MOD ADJUST R643 for zero tone deviation. Next, with the 1-Volt 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 R643 for 0.75 kHz tone deviation.
5. For multi-frequency transmitters, set the deviation as described in Steps 3 or 4 on the channel producing the largest amount of deviation.

PA POWER INPUT

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

$$P_1 = \text{PA voltage} \times \text{PA current}$$

where:

P_1 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 (read as 30 amperes full scale).

Example:

$$P_1 = 12 \text{ Volts} \times 16 \text{ Amperes} = 192 \text{ Watts}$$

CRYSTAL MODULE FREQUENCY ADJUSTMENT

First, check the frequency to determine if any adjustment is required. The frequency should be set using 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 30°C (86°F).

The oscillator should be reset only when the frequency shows deviation in excess of the following limits:

A. ± 0.6 PPM, when the radio is at 30°C (86°F).

B. ± 5 PPM at any other temperature within the range of -30°C to +75°C (-22°F to +167°F).

If an adjustment is required, proceed as follows:

If the radio is at an ambient temperature of 30°C (86°F), set the oscillator for correct operating frequency.

If the radio is not at an ambient temperature of 30°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 crystal oscillators):
 1. Maintain the radio at 30°C and set the oscillator to desired frequency, or
 2. Maintain the radio at 30°C (+5°C, -15°C) offset the operating frequency as a function of actual temperature, by the amount shown in Figure 4.

For example: Assume the ambient temperature of the radio is 20°C (68°F). At that temperature, the curve shows a correction factor of 675 Hz.

Set C3 on the selected crystal module for a reading of 675 Hz higher than the licensed operating frequency. If a negative correction factor is obtained (at temperatures above 30°C), set the oscillator for the indicated frequency lower than the licensed operating frequency.

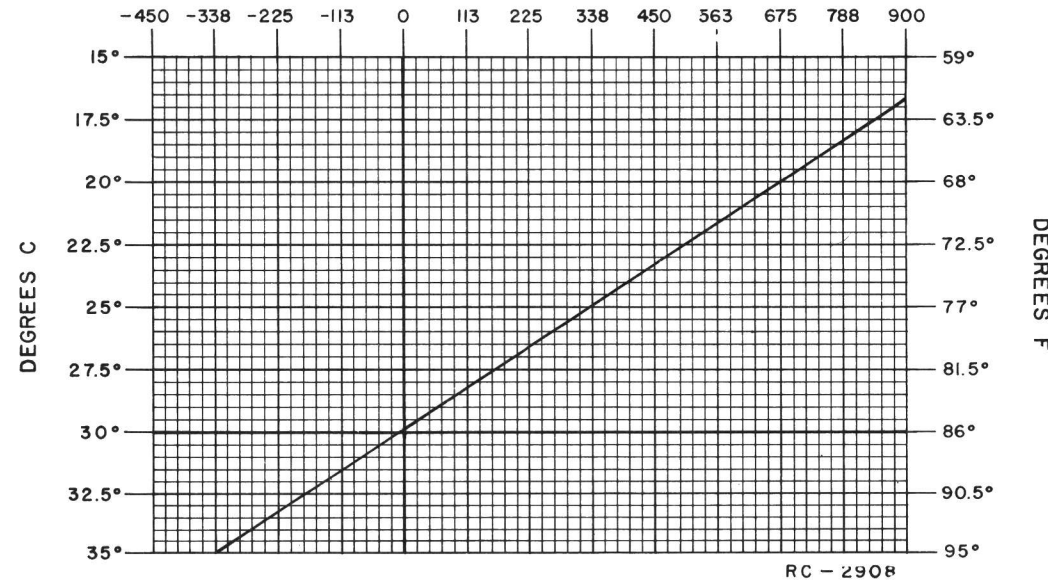


Figure 4 - Frequency Offset Chart

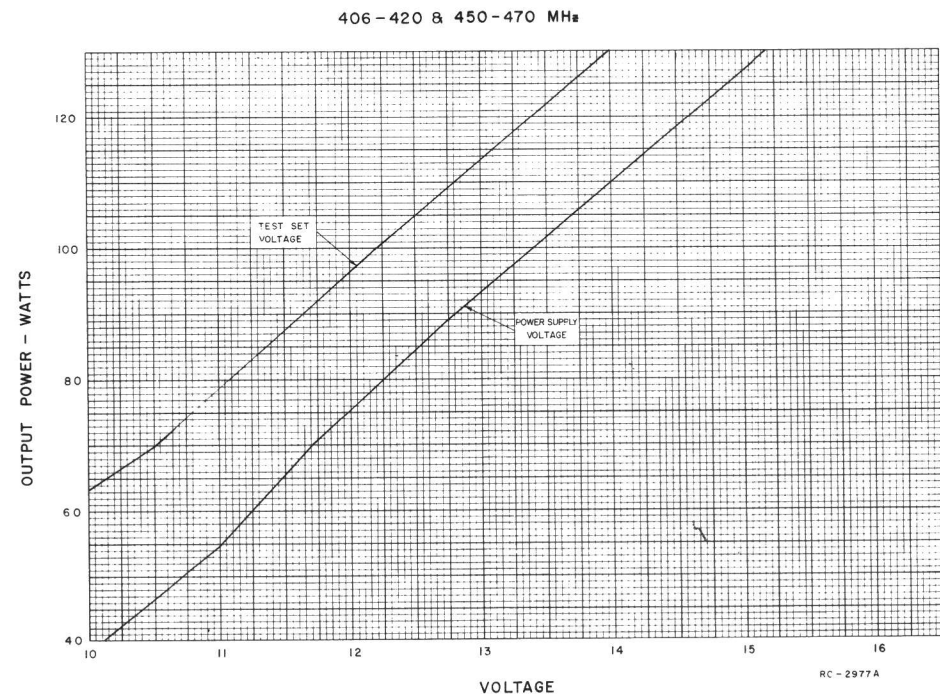
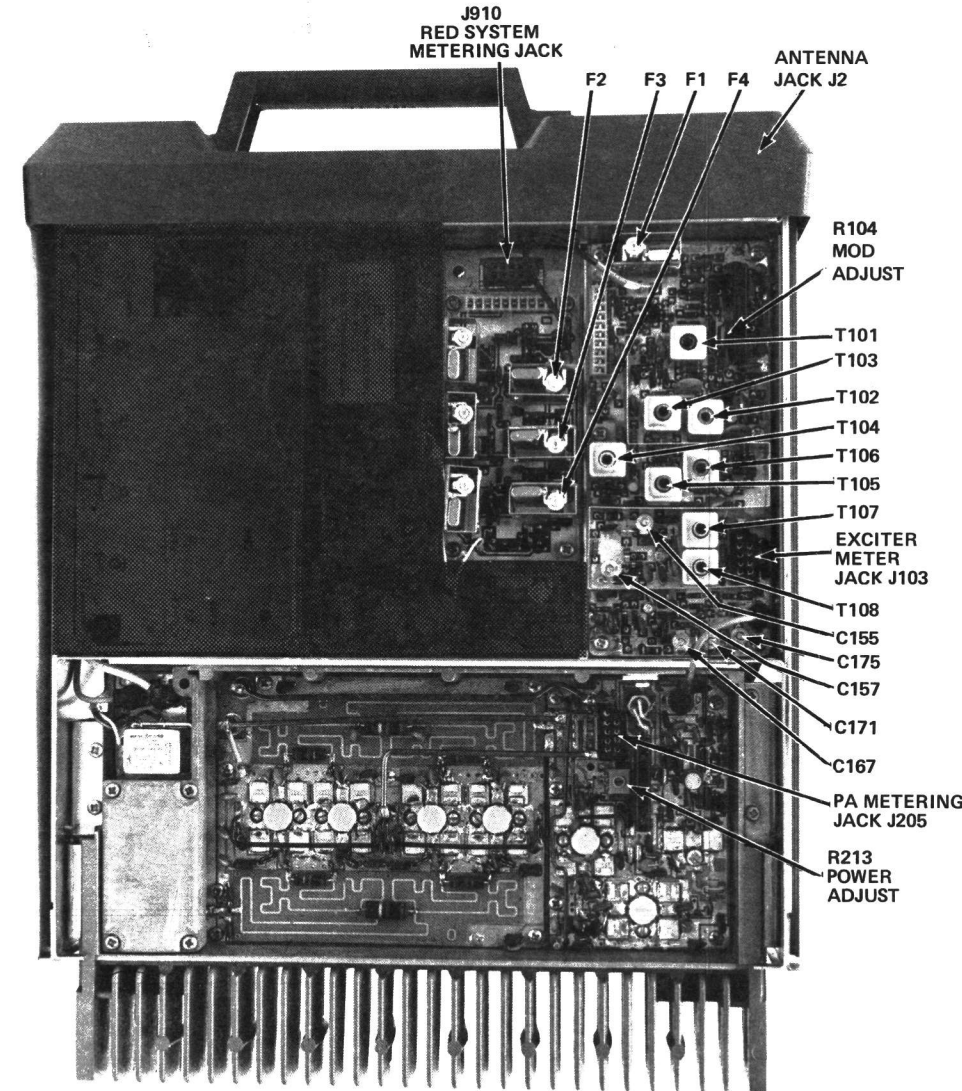


Figure 5 - Power Output Setting Chart

TRANSMITTER ALIGNMENT

EQUIPMENT

1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
2. A 50-ohm wattmeter connected to antenna jack J2.
3. A frequency counter.
4. Deviation Monitor.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place crystal modules for F1 on Exciter Board and F2-F4 on multi-frequency board, (crystal frequency = operating frequency \pm 36). In station applications where a stability of 0.0002% is required, ICOMs are used. Place all ICOMs on the multi-frequency board.
2. For a large change in frequency or a badly mis-aligned transmitter, preset all slugs to the top of the coil form.
3. Set output impedance matching capacitor to 1/4 mesh.
4. Set all other air variable capacitors to minimum capacity (not meshed).

NOTE

The tuning frequency for multi-frequency transmitters is determined by the operating frequency and the frequency spread between transmitters. Refer to the table below for maximum frequency spread.

Multi-frequency Transmitter Tuning

Transmitter Frequency Range	MAXIMUM FREQUENCY SPREAD		
	(1) Without center tuning	(2) With center tuning	(3) With center tuning (1 dB degradation)
406 - 420 MHz & 450 - 470 MHz	2.50 MHz	5.50 MHz	9.00 MHz
470 - 494 MHz	2.75 MHz	5.80 MHz	9.00 MHz
494 - 512 MHz	3.00 MHz	6.00 MHz	9.75 MHz

6. Connect the red plug on the GE Test Set to the SAS 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.

NOTE: With the Test Set connected to the PA metering jack, the voltage reading at position "F" with the HIGH SENSITIVITY button pressed may be converted to driver collector current by reading the current as 15 amperes full scale. The voltage reading at position "G" with the HIGH SENSITIVITY button pressed may be converted to PA collector current by reading the current as 30 amperes full scale.

7. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

NOTE

When the need for minor adjustments to the transmitter are indicated, perform steps 13 through 17 for a quick transmitter tune-up.

ALIGNMENT PROCEDURE

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
				NOTE: When aligning transmitter, proceed as instructed below. DO NOT retune a previously tuned control unless specifically directed to do so.
1.	B (MULT-1)	T101, T102 & T103	See Procedure	Tune T101 for maximum meter reading. Then tune T102 for a dip (small) in meter reading and tune T103 for maximum meter reading.
2.	C (MULT-2)	T104 and T105	See Procedure	Tune T104 for maximum meter reading, then tune T105 for a dip (small) in meter reading.
3.	D (MULT-3)	T106 and T107	See Procedure	Tune T106 for maximum meter reading and then tune T107 for a dip in meter reading.
4.	F (MULT-4)	T108 and C155	See Procedure	Tune T108 for maximum meter reading and then tune C155 for a dip in meter reading.
5.	G (AMPL-1)	C157 and C167	See Procedure	Tune C157 for maximum meter reading, and then tune C167 for a dip in meter reading.
6.	A (Rel. Power Out)	C171 and C175	Maximum	Tune C171 and then C175 for maximum meter reading.
7.	B (MULT-1)	T101	Maximum	Tune T101 for maximum meter reading.
8.	C (MULT-2)	T102, T103 & T104	Maximum	In order, tune T102, T103 and T104 for maximum meter reading.
9.	C (MULT-3)	T105 and T106	Maximum	Tune T105 and then T106 for maximum meter reading.

ALIGNMENT PROCEDURE (Cont'd)

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
10.	F (MULT-4)	T107 and T108	Maximum	Tune T107 and then T108 for maximum meter reading.
11.	G (AMPL-1)	C155 and C157	Maximum	Tune C155 and then T108 for maximum meter reading.
12.	A (Rel. Power Out)	C167, C171 & C175	Maximum	In order, tune C167, C171 and C175 for maximum meter reading.
				NOTE: A quick transmitter tune-up procedure is provided in steps 13 through 17.
13.	C (MULT-2)	T102, T103 and T104	Maximum	Alternately tune T102, T103 and T104 for maximum meter reading.
14.	D (MULT-3)	T105 and T106	Maximum	Alternately tune T105 and T106 for maximum meter reading.
15.	F (MULT-4)	T107 and T108	Maximum	Alternately tune T107 and T108 for maximum meter reading.
16.	G (AMPL-1)	C155 and C157	Maximum	Alternately tune C155 and C157 for maximum meter reading. For optimum operation repeat steps 13 through 16.
17.	A (Rel. Power Out)	C167, C171 and C175	Maximum	Alternately tune C155, C171 and C175 for maximum meter reading.
		R213		With the battery voltage at 13.4 Volts or the PA collector voltage at 12.2 Volts, set Power Adjust potentiometer R213 on the PA DRIVER board for the desired power output from 30 Watts to specified power output. If the battery voltage is not at 13.4 Volts or the collector voltage at 12.2 Volts and full rated output is desired, set R213 for the output power according to the battery voltage or collector voltage shown in Figure 5, 6 or 7.
				NOTE: The PA collector voltage is measured as described in the PA POWER INPUT section.

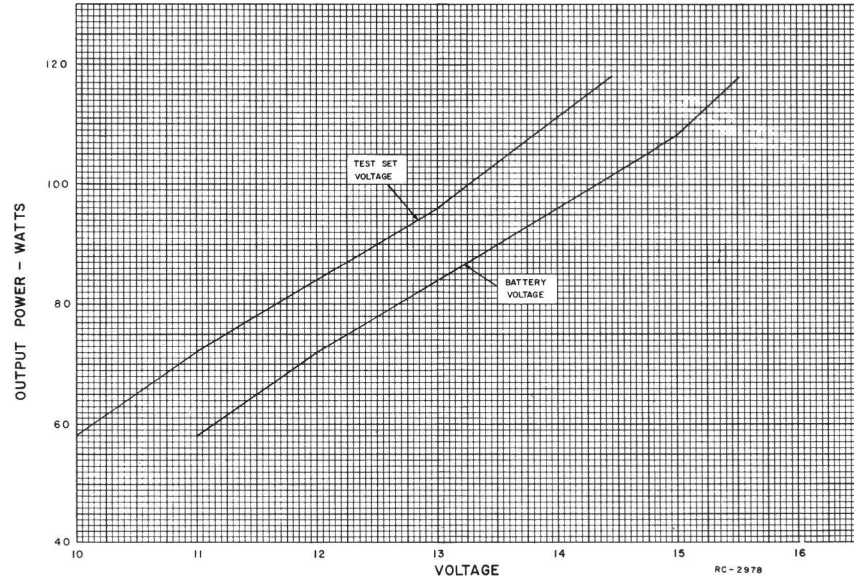


Figure 6 - Power Output Setting Chart

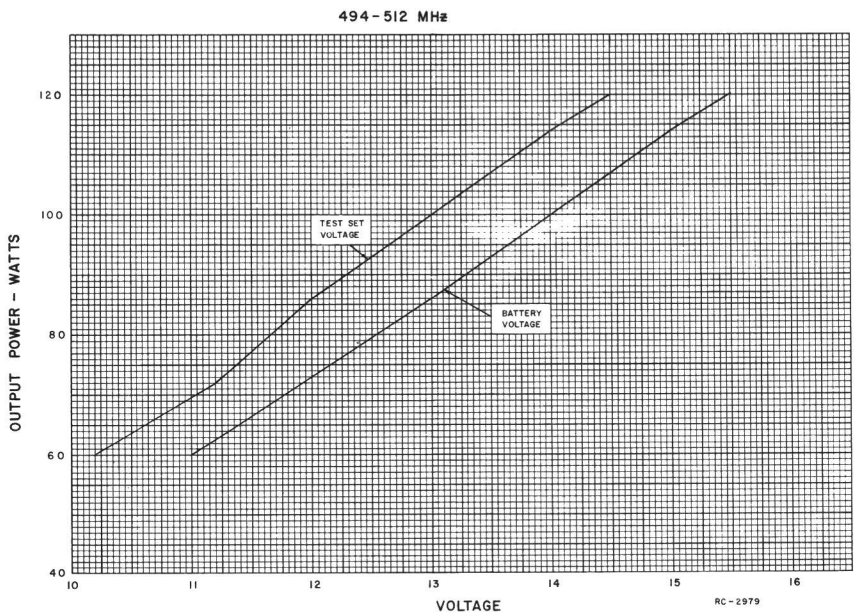


Figure 7 - Power Output Setting Chart

ALIGNMENT PROCEDURE

406—512 MHz, 100 WATT
 MASTR EXECUTIVE II TRANSMITTER

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.

CAUTION

Before bench testing the MASTR Executive II Mobile Radio, be sure of the output voltage characteristics of your bench power supply.

To protect the transmitter power output transistors from possible instant destruction, the following input voltages must not be exceeded:

- Transmitter unkeyed: 20 Volts
- Transmitter keyed (50 ohm resistive load): 18 Volts
- Transmitter keyed (no load or non-resistive load): 15.5 Volts

These voltages are specified at the normal vehicle battery terminals of the radio and take the voltage drop of standard cables into account. The voltage limit shown for a non-optimum load is for "worst case" conditions. For antenna mismatches likely to be encountered in practice, the actual limit will approach the 18 Volt figure.

Routine transmitter tests should be performed at EIA Standard Test Voltages (13.6 VDC for loads of 6 to 16 amperes; 13.4 VDC for loads of 16 to 36 amperes). Input voltages must not exceed the limits shown, even for transient peaks of short duration.

Many commonly used bench power supplies cannot meet these requirements for load regulation and transient voltage suppression. Bench supplies which employ "brute force" regulation and filtering (such as Lapp Model 73) may be usable when operated in parallel with a 12-Volt automotive storage battery.

TEST EQUIPMENT REQUIRED

for test hookup as shown:

- | | | |
|--|--|--------------------------------|
| 1. Wattmeter similar to: | 2. VTVM similar to: | 3. Audio Generator similar to: |
| Bird # 43 | Triplet # 850 | GE Model 4EX6A10 |
| Jones # 711N | Heath # IM-21 | |
| 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 (R213).

Refer to the QUICK CHECKS on the Transmitter Troubleshooting Procedure.

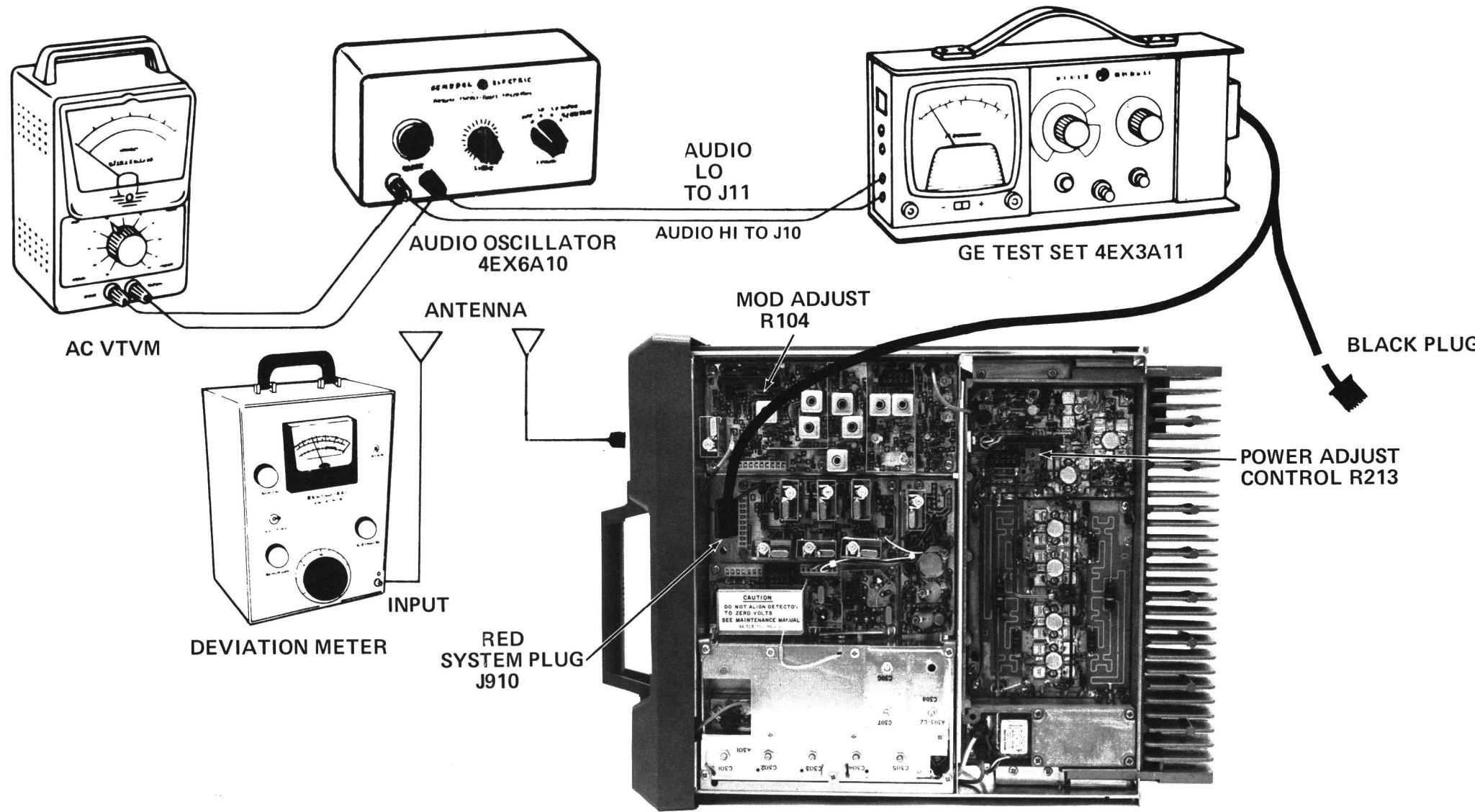
VOICE DEVIATION , SYMMETRY AND AUDIO SENSITIVITY

TEST PROCEDURE

1. Connect the test equipment to the transmitter as shown.
2. In radios equipped with Channel Guard set Channel Guard Mod Adjust for zero tone deviation. NOTE: When external Channel Guard is used, adjust Channel Guard Mod Adjust R982 on SAS board for zero tone deviation.
3. Set the audio generator output to 1.0 VOLTS RMS and frequency to 1 kHz.
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 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 Executive II 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 Step 1 as shown in the Transmitter Alignment Chart.
8. Check audio sensitivity by reducing generator output until deviation falls to 3.0 kHz for radios without Channel Guard, or 2.25 kHz for radios with Channel Guard. Voltage should be LESS than 120 millivolts. If not, refer to the Transmitter Troubleshooting Procedure.



TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

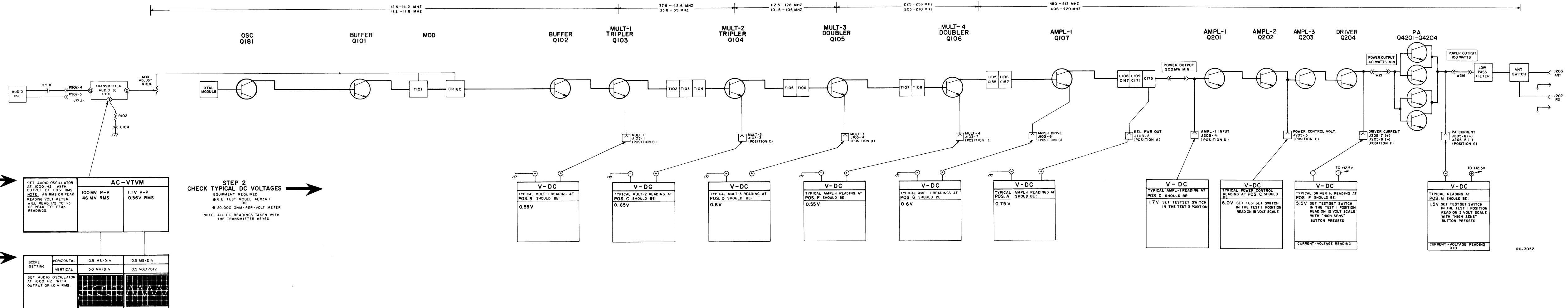
1. Set up the deviation meter and monitor the output of the transmitter.
2. Remove the 1000 Hz signal from the audio generator.
3. Key the transmitter and check for 0.75 kHz deviation. If the reading is low or high, adjust Channel Guard MOD ADJUST R643 for a reading of 0.75 kHz.

NOTES:

1. On units supplied with Channel Guard, the Phase Modulator Tuning should be adjusted carefully to insure proper performance. (Refer to Steps 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 1 - QUICK CHECKS

METER POSITION GE TEST SET	PROBABLE DEFECTIVE STAGE		
	HIGH METER READING	LOW METER READING	ZERO METER READING
EXCITER			
B (MULT-1)	Q102, Q103, T102	Q102, Q103 T102	Q102, Q103, T102
C (MULT-2)	Q104, T105	T102, T103, Q104, T104	T102, T104, Q104, T105, T103
D (MULT-3)	Q105, T107	T105, T106, Q105, T107	T105, T106, Q105, T107
F (MULT-4)	Q106, C155	Q106, T107, T108	Q106, T107, T108 L104
G (AMPL-1)	Q107, L113	Q107, C115 - C157	Q107, C155 - 157 L107
A (Power Out)	W216	CR181, C190 Q107	CR181, C190, Q107 C167, C171, C175
POWER AMPLIFIER			
C (Power Control)		Q215, R213, VR201, VR202, U201, Q202	Q215, R213, VR201, VR202, U201
D (AMPL-1 INPUT)		Low Output Exciter, CR201	No Output Exciter, CR201, C205
F (DRIVER CURRENT)	Q204, T205	Q204, Low Output Q203	Q204, No Input From Q203, Check Pos. C & D
G (PA CURRENT)	Q4201-Q4204	Low Drive	No Drive Q4201-Q4202

STEP 3
CHECK AUDIO AC VOLTAGESEQUIPMENT REQUIRED
● AUDIO OSCILLATOR
● AC VTVMSTEP 4
AUDIO & OSC WAVEFORMSEQUIPMENT REQUIRED
● AUDIO OSCILLATOR
● OSCILLOSCOPE

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

GENERAL  ELECTRIC